PB82-120320

Appendix to Finding of No Significant Impact
Clear Creek Interceptor Project

Dames and Moore
Golden, CO

Prepared for

Environmental Protection Agency
Denver, CO

Jan 81

U.S. Department of Commerce
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PB82-120320

UNITED STATES
ENVIRONMENTAL PROTECTION
AGENCY

REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO
80295

EPA 908/5-81-002

JANUARY 1981

EPA

TECHNICAL REPORT

APPENDIX to

FINDING OF NO SIGNIFICANT IMPACT

CLEAR CREEK INTERCEPTOR PROJECT

METRO DISTRICT

COMMERCE CITY, COLORADO

PREPARED BY:

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TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
EPA 908/5-81-002

2.

3. RECIPIENT'S ACCESSION NO.
PB82 120320

4. TITLE AND SUBTITLE
Technical Report Appendix to Finding of No Significant Impact, Clear Creek Interceptor Project

5. REPORT DATE
January 1981

6. PERFORMING ORGANIZATION CODE
U288091

7. AUTHOR(S)
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8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Dames and Moore
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10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
U.S. Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

13. TYPE OF REPORT AND PERIOD COVERED

14. SPONSORING AGENCY CODE
8W-EE

15. SUPPLEMENTARY NOTES
Accompanies a Finding of No Significant Impact, Clear Creek Interceptor Project, Metro District, Commerce City, Colorado

16. ABSTRACT

The report evaluates the segment of Clear Creek from Golden, Colorado to its confluence with the South Platte River. It was determined that additional study was necessary to define the water flow changes, water quality, aquatic life and water rights changes that would occur with the implementation of the Metro District's Clear Creek Interceptor. The study also considered the added effect of the newly proposed Golden/Coors wastewater treatment plant.

The study effort developed a flow balance on Clear Creek taking into account all diversions, return flows, etc. This balance was then used to predict effects on water quality and aquatic habitat. A literature search and field investigation was also done to define the aquatic habitat suitability of various Clear Creek stream reaches. The study defined impacts on existing irrigated agriculture from future urban development.

A number of mitigation strategies were defined to try to protect the water quality, aquatic habitat, and agricultural lands supported by Clear Creek. The recommendations are considered in the Clear Creek Finding of No Significant Impact document.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Sewer Interceptor	Metro District	
Aquatic Habitat	Clear Creek	
Streamflow Analysis	metropolitan Denver	
Agricultural Lands		
Irrigated Agriculture Land Conversions		

Dis i

18. DISTRIBUTION STATEMENT
Release Unlimited

19. SECURITY CLASS *(This Report)*

20. SECURITY CLASS *(This page)*

21. NO. OF PAGES
246

22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

United States
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

EPA 908/5-81-002
January, 1981

TECHNICAL REPORT APPENDIX to

Finding of No Significant Impact

CLEAR CREEK INTERCEPTOR PROJECT

Metro District
Commerce City, Colorado

Prepared by:

Dames & Moore
Golden, Colorado

-1-b

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SUMMARY

EPA Region VIII contracted with Dames & Moore to prepare a study analyzing the flow-related impacts of the Clear Creek Facilities Plan, including both the Clear Creek Interceptor 201 plan approved by Metro District (MDSDD) and the recently announced Golden/Coors municipal wastewater treatment plant. Dames & Moore's studies included data gathering activities, impact analysis, mitigation technique development and negotiations and consultation. The study focused on the effects of changes in Clear Creek streamflow caused by both the proposed interceptor to the MDSDD Central Plant and the addition of a new Golden/Coors plant. The heart of the impact analysis was a water balance on Clear Creek which provided monthly average streamflows for present conditions and allowed the calculation of streamflow changes for the present and year 2000 situations with the project in place. Streamflow changes were also calculated for conditions in which the project is in place and existing in-basin wastewater treatment plants (WWTP) operated by Clear Creek Valley Water and Sanitation District, City of Arvada and Wheat Ridge Sanitation District close down. Based on these results, impacts on water rights, water quality, agricultural lands and aquatic habitat were assessed. The study also included consideration of utilization of the proposed interceptor corridor for recreational purposes after pipeline construction.

FINDINGS

1. The results of the impact analysis indicated that the project (MDSDD Clear Creek interceptor and Golden/Coors plant) will have substantial streamflow related impacts on the Clear Creek Basin. Streamflows will be augmented in the reach of Clear Creek between McIntyre and Youngfield Streets during irrigation season months. If the existing in-basin plants remain open, a portion of the streamflow benefits will continue all the way down to the Clear Creek and Platte River Ditch near Pecos Street. If the in-basin plants close, increased flows due to the Golden/Coors plant will not be enough to avoid adverse impacts on streamflow in the reach of Clear Creek from Marshall Street to Pecos Street.

2. An assessment of the aquatic habitat potential was made for Clear Creek. Physical stream characteristics and streamflow indicate that the reach from below Croke Canal to Youngfield Street has extremely limited aquatic habitat potential because of channelization and lack of flow; the reach from Youngfield Street to the Wheat Ridge WWTP has reasonable physical streambed, riparian, and water quality characteristics for a fishery and is essentially limited only by streamflow; and the reach below the Wheat Ridge plant to the confluence with the South Platte is severely degraded by urban runoff, landfill leachate and wastewater treatment plant discharges, with a limited substrate for aquatic habitat.

3. Findings in this study indicate that the low flow value of 42.7 cfs used in the past wasteload allocation studies is an order of magnitude higher than typical low flow conditions at the existing and planned WWTP discharge points, allowing adverse water quality impacts even when currently proposed discharge requirements are met.

4. Adverse impacts resulting from streamflow losses on Clear Creek include:

a) diversion losses to the Clear Creek and Platte River and Colorado Agricultural Ditches during the runoff season and to the above ditches plus Fisher Ditch during the late summer/fall irrigation season;

b) improvement in water quality for pollutants emitted by WWTP's, such as chlorine and ammonia, in Clear Creek below the existing in-basin plant discharges but further degradation below the Golden/Coors plant outfall at McIntyre Street, depending upon new in-stream water quality and discharge standards. In the reduced flow reach below Marshall Street, agricultural and urban runoff quality will play an increasing role in determining in-stream water quality.

c) mixed impacts of the project on aquatic habitat and establishment of fisheries. Increases in streamflow in the higher potential (under present conditions) reach of Clear Creek above Marshall Street may possibly be nullified by future quality degradation. Further study of the critical minimum flows required for fish survival in Summer and Winter conditions is needed to assure benefits to aquatic habitat by the Golden/Coors plant and recommended mitigation measures. Conditions in the reach below Marshall Street may not be significantly improved by in-basin plant closures.

d) adverse impacts on agricultural lands will occur in the Fisher, Colorado Agricultural, and Clear Creek and Platte River ditches service areas. While impacts on Fisher Ditch are not considered substantial since agricultural lands served will probably urbanize anyway, impacts on lands in the other ditches' service areas will be substantial, since some lands will not be developed and are considered Prime Agricultural Lands. These latter lands are the most significant remaining agricultural lands within Clear Creek Basin.

e) impacts on potable water supplies will be mixed. While the quantity of supply to Northglenn and, primarily, Thornton from Fisher, Colorado Agricultural and Clear Creek and Platte River ditches will be significantly depleted, quality of supply to Crestview Water and Sanitation District through Kershaw Ditch, in addition to Northglenn and Thornton, will be improved by closure of the existing in-basin plants.

RECOMMENDATIONS FOR MITIGATION

Based on the study, the following mitigation measure alternatives have been proposed to augment streamflows, enhance water quality and aquatic life habitat in selected stream reaches, and protect existing irrigated agriculture in the lower Clear Creek area. One or a number of these alternatives could be combined to best meet overall Clear Creek needs:

a. Increasing in-basin treatment at the Golden/Coors plant of native flows;

This would involve a cooperative agreement to treat current Metro flows of native water at the Golden/ Coors plant.

b. Pumping back effluent from the Metro plant to Clear Creek;
While this would protect lower Clear Creek agricultural lands, it is unclear who would pay for this service.

c. Modify stream classifications and treatment standards;
To meet some of the higher use possibilities (drinking water, aquatic life goals) some form of advanced waste treatment might be necessary at both the Golden plant and the three wastewater plants.

d. Purchase in-stream flow rights;
This would be done to allow water maintained in-stream for water quality, aquatic life, to be diverted at the lower Clear Creek ditches.

e. Transfer municipal points of diversion to maintain water in Clear Creek.
This would involve keeping municipal water supply diversions through the lower Clear Creek ditches and upgrading the treatment plants on the Creek.

In addition, findings of this study indicate that a recreational corridor, probably a horse trail, is feasible utilizing the proposed interceptor route in the reach from Youngfield Street to either Kipling Street or Wadsworth Boulevard. Further, several Federal, state and local funding sources, including EPA 201 construction grants funds, are available to construct the trail over the pipeline. However, need and support for the trail among local governments and parks agencies must be established. If the need is established, the City of Wheat Ridge and MDSDD would need to negotiate an agreement on a funding mechanism, and later to complete designs on the recreational trail and manage coordination of trail and pipeline construction.

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1.0 PURPOSE AND OBJECTIVES

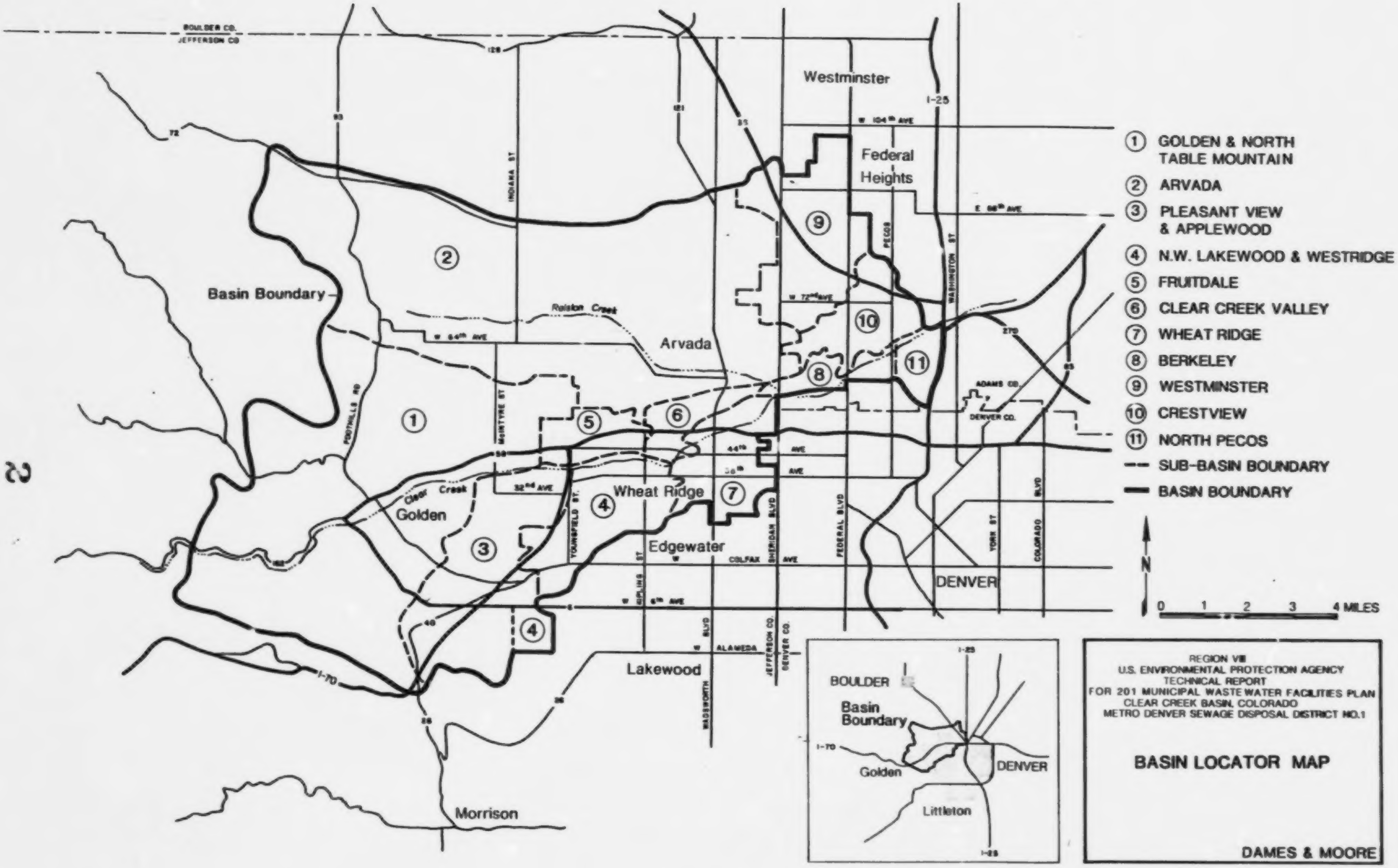
1.1 HISTORY

The planning process leading to this study began in 1974 when CH2M Hill conducted water quality studies in Clear Creek Basin at the request of the Denver Regional Council of Governments (DRCOG). These studies recommended construction of a satellite treatment plant on Clear Creek. Such a plant would augment in-stream flows for downstream use, and help maintain water quality. The Clean Water Plan published by DRCOG in 1977 reaffirmed this position by recommending the satellite facility, but noted possible difficulties in attaining stream quality sufficient to maintain desired uses.

In August 1977, the Metropolitan Denver Sewage Disposal District No. 1 (MDSDD) completed a facility plan for the Clear Creek Basin as required under Section 201 of the Clean Water Act. This plan considered two basic approaches for handling the increasing wastewater flows in the basin. One was construction of a satellite plant on Clear Creek, as recommended by the DRCOG studies. The other was expansion of the existing interceptor system which conveys flows from the Clear Creek basin to the MDSDD Central Plant in Commerce City. The Facilities Plan concluded that cost effectiveness considerations strongly favored the expanded interceptor plan, and this was thus designated as the proposed alternative (CH2M Hill, 1977). The Clear Creek Basin, which constitutes the Facility Plan area, is shown on the locator map in Figure 1-1.

EPA prepared an "Overview" Environmental Impact Statement (EIS) for ten Denver Metropolitan Area 201 planning studies including Clear Creek in 1978. The final action document associated with the EIS defined the following special condition for Clear Creek:

> "EPA prefers that a sub-regional facility be constructed in the Clear Creek Basin below Golden and Coors which would serve to maintain in-stream water quality and flows. Additional study is necessary through the Clean


BOULDER CO.
JEFFERSON CO
Westminster
Federal Heights
W 104th AVE
E 88th AVE
W 72nd AVE
W 64th AVE
I-25
270
Basin Boundary
Ralston Creek
Arvada
Clear Creek
Golden
Wheat Ridge
Edgewater
Lakewood
Morrison
DENVER
ADAMS CO.
DENVER CO.
JEFFERSON CO.
FOOTHILLS RD
INDIANA ST
McINTYRE ST
YOUNGFIELD ST.
KIPLING ST
WADSWORTH BLVD
SHERIDAN BLVD
FEDERAL BLVD
PECOS
WASHINGTON ST
YORK ST
COLORADO BLVD
44th AVE
38th AVE
32nd AVE
COLFAX AVE
W 6th AVE
W ALAMEDA
I-70
72
93
128
121
36
58
6
40
26
85
① GOLDEN & NORTH TABLE MOUNTAIN
② ARVADA
③ PLEASANT VIEW & APPLEWOOD
④ N.W. LAKEWOOD & WESTRIDGE
⑤ FRUITDALE
⑥ CLEAR CREEK VALLEY
⑦ WHEAT RIDGE
⑧ BERKELEY
⑨ WESTMINSTER
⑩ CRESTVIEW
⑪ NORTH PECOS
SUB-BASIN BOUNDARY
BASIN BOUNDARY
N
0 1 2 3 4 MILES
BOULDER
Basin Boundary
Golden
DENVER
Littleton
I-70
I-25

REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL REPORT
FOR 201 MUNICIPAL WASTE WATER FACILITIES PLAN
CLEAR CREEK BASIN, COLORADO
METRO DENVER SEWAGE DISPOSAL DISTRICT NO.1

BASIN LOCATOR MAP

DAMES & MOORE

FIGURE I-I

> Water Plan and facility planning to resolve any conflicts. EPA will reserve judgment on whether the remainder of the basin should receive treatment at the Metro facility until such time as the State decides upon the Clean Water Plan's proposed classification for Clear Creek and further analysis is made to determine the feasibility of discharging effluent from these facilities to Clear Creek or to downstream irrigation ditches on a full or part time basis."

DRCOG reversed its former position in March 1979 by voting to approve the interceptor alternative for the Clear Creek Basin. In addition, several municipalities announced plans to alter their use of Clear Creek flows, and other new circumstances arose subsequent to Facility Plan completion. Most recently, the City of Golden and the Adolph Coors Company signed an agreement under which Coors would treat their combined municipal wastewater flow at a locally-funded treatment plant below Golden.

As a result, EPA determined that a re-analysis of overall impact of the combined interceptor and Golden/Coors plant was necessary to comply with National Environmental Policy Act provisions relating to the 201 Facility Plan. EPA subsequently contracted with Dames & Moore to conduct such a study, the results of which are reported herein.

1.2 SCOPE

During this study, Dames & Moore conducted data gathering, impact analysis, mitigation technique development, and negotiation and consultation work. Field work was limited to a brief reconnaissance along the creek and field checking of agricultural lands, with all other analysis being based on existing information and direct contacts with pertinent parties. Flow impact studies conducted in the facilities plan and a supplementary study (Leonard Rice, 1978) were extended to account for effects of new in-basin treatment facilities under the Golden/Coors proposal. Environmental impact studies concentrated on assessing the effects of the proposed interceptor expansion and Golden/Coors plant on stream flows, water quality/use, water rights, aquatic habitat/fisheries, agricultural lands, and recreation.

1.3 OBJECTIVES

The studies reported herein were designed to provide EPA with the information to evaluate the impacts on the Clear Creek Basin from the MDSDD proposal given EPA's position on the "Overview" EIS and with the recently proposed wastewater treatment plant changes. EPA tentatively expects to issue a Finding of No Significant Impact (FNSI) for the Clear Creek Facility Plan at this point in time.

1.4 REPORT STRUCTURE

This technical report independently evaluates the impact of the MDSDD proposal on Clear Creek Basin and will serve as a support document for the FNSI. Support information contained herein is incorporated in the FNSI by reference. Readers desiring further detail on any determinations or impact assessments presented in the FNSI will find this report serves that need. Descriptions of some of the more complex methodologies used in this study have been appended in the interest of keeping the text more readable.

Sections 2 and 4, the existing conditions and impacts discussions respectively, are organized by the major study issues with parallel subheadings to facilitate comparisons. The general methodology employed involves analysis of streamflows and related or affected aspects of the local environment. The basis of the discussions is an analysis of existing gauged streamflows, diversion patterns, water uses, return flows, and wastewater discharges, to yield estimates of average monthly streamflow along Clear Creek from the U.S.G.S. gauge above Golden to the mouth. These estimates have been completed for past, present, and future conditions to identify the effects of the existing interceptor and the proposed project and to allow assessments of impacts on water quality, agriculture, aquatic habitat and fisheries, and water rights.

2.0 EXISTING CONDITIONS

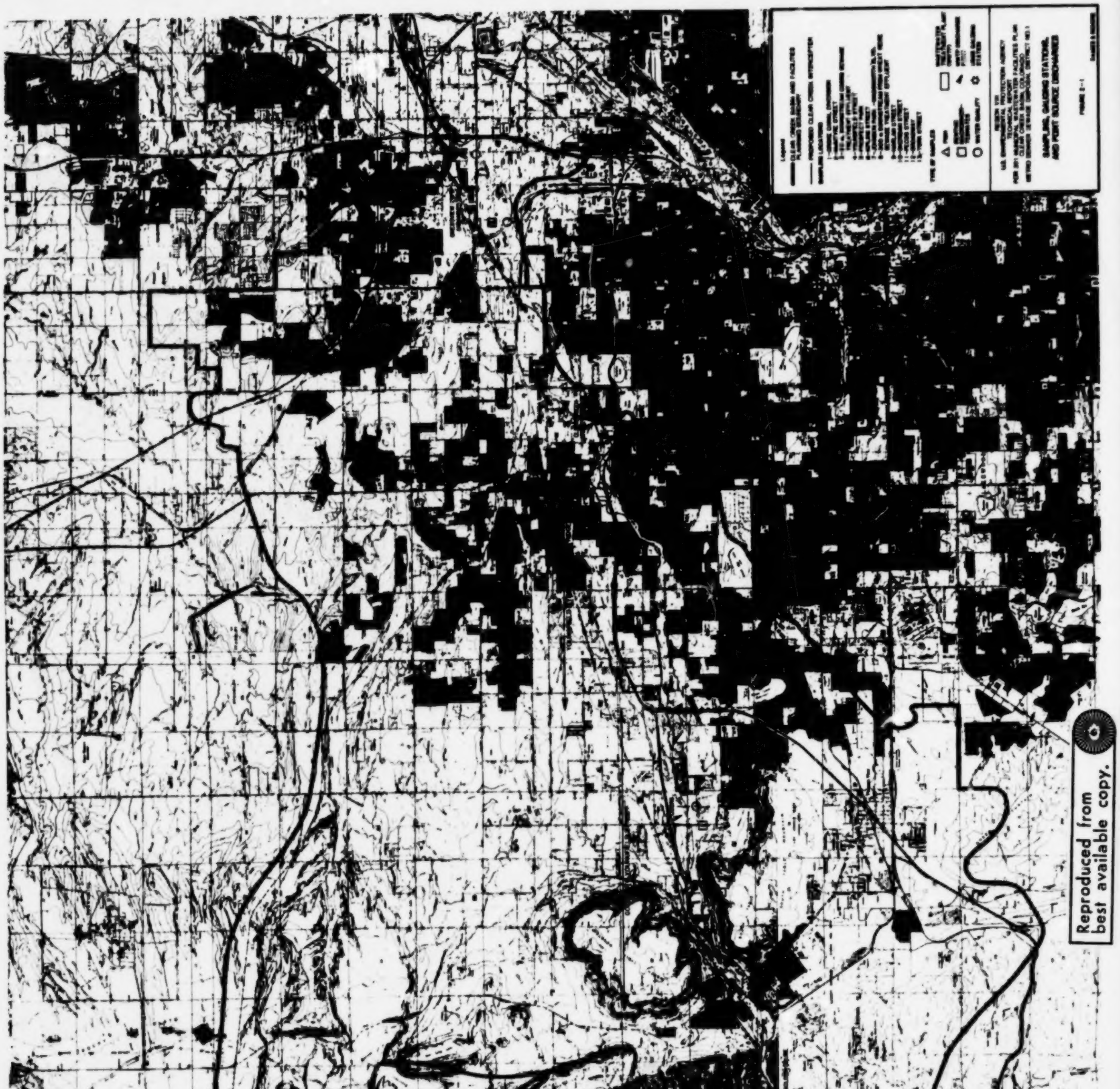
In this section, data are presented which allow the analysis of flow-related impacts in Section 4.0. Also, information is presented which allows the analysis of opportunities for enhancement of recreational use of the Clear Creek corridor by use of the interceptor route. Sections 2.0 and 4.0 are organized in parallel to facilitate comparison of the existing environment with the future project affected environment of the Clear Creek Basin. The basin is illustrated in relation to the rest of the State of Colorado in Figure 1-1.

2.1 WASTEWATER TREATMENT

A profile of existing methods of wastewater disposal for the Clear Creek Basin is provided in this section to aid in the understanding of existing Clear Creek water quality problems (Section 2.4) and the effects of the chosen alternative (Section 3.0) on wastewater treatment methods and future water quality.

The existing wastewater treatment facilities and discharge points in the Clear Creek Basin are shown in Figure 2-1. The Clear Creek Interceptor shown is actually the chosen plan, but follows roughly the same route as the existing interceptor to the MDSDD Central Plant, where most of the municipal wastewater treatment for the basin is provided. Other municipal facilities presently operating in the basin include plants operated by Wheat Ridge Sanitation District, City of Arvada, Clear Creek Valley Water and Sanitation District, and Northwest Lakewood Sanitation District. All except Clear Creek Valley are members of the MDSDD and contribute additional wastewater flows to the existing interceptor and central plant. The Northwest Lakewood plant discharges all wastewaters to the interceptor. The Arvada plant discharges to Ralston Creek just above its mouth.

One major industrial discharger, Adolph Coors Company, operates facilities in the basin. It should be noted that Coors employs two process wastewater discharge points. During winter months, roughly


SAMPLING, GAGING STATIONS, AND POINT SOURCE DISCHARGES

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November through March, effluent is discharged to Croke Canal, which diverts from the north bank of Clear Creek about two-thirds miles east of the plant (Jaquet, 1980). The remainder of the year, effluent is discharged to Clear Creek about 300 yards east of McIntyre Street. In addition to process wastewater, Coors discharges non-contact cooling water to Clear Creek at several points near its main plant. Other industrial type dischargers in the basin are Cotter Corporation's Schwartzwalder Mine, Public Service Company's (PSC) Leyden gas storage facilities, and Western Paving Company. Leyden PSC involves well pumping into ponds which seldom discharge to surface waters. Cotter Corporation discharges mine water to Ralston Creek above Ralston Reservoir. Western Paving has a very small discharge from its asphalt plant at 64th and Pecos.

Table 2-1 shows the type of treatment, NPDES permit limitations, and effluent flow and quality in 1979 for the major municipal and industrial dischargers. In addition to those discharges listed in Table 2-1, Cotter Corporation Schwartzwalder Mine has limitations and discharge parameters listed in Table 2-2.

The municipal plants are achieving marginal secondary treatment. The Arvada and Wheat Ridge plants are trickling filter type and have trouble meeting BOD and TSS limitations during the cold weather months. The Arvada, Wheat Ridge, and Clear Creek Valley plants have all had trouble meeting fecal coliform and residual chlorine requirements (Woodling, in preparation) although Clear Creek Valley had no violations during 1979. The MDSDD Central Plant discharges to the South Platte River rather than Clear Creek, as shown in Figure 2-1, and effectively provides secondary effluent quality. The Crestview Water and Sanitation District plant is shown in Table 2-1, since it contributed pollutants and stream flow to the lower part of the basin in the recent past.

Data for Coors in Table 2-1 show that there are different permit limits for BOD, TSS, and Total Residual Chlorine when discharge is to Croke Canal rather than Clear Creek. Limits for discharge to Clear Creek are in Table 2-1; limits for discharge to Croke Canal are as follows:

TABLE 2-1

EXISTING
WASTEWATER DISCHARGES

1979 QUALITY(1)

Plant/Discharger	Type of Treatment	Flow MGD	Effluent Quality (NPDES Limit)				
			BOD mg/1	TSS mg/1	F.COLI #/100ml	Cl_2 mg/1	NH_3 mg/1asN
Arvada	Trickling Filter	0.82 (0.9 CAP)	19.1 (30/45) (2)	27.8 (30/45)	190 (1000/2000)	0.41 (0.5)	16.4 (-)
Wheat Ridge	Trickling Filter	1.57 (2.5 CAP)	30.9 (30/45)	25.5 (30/45)	1178 (3000/6000)	0.45 (0.5)	11.9 (-)
Clear Creek Valley	Activated Sludge	1.85 (2.1 CAP)	12.8 (30/45)	16.2 (30/45)	1001 (1000/2000)	0.48 (0.5)	- (-)
Northwest Lakewood	Primary	2.2 (2.2 CAP)	DISCHARGE PRIMARY EFFLUENT TO MDSDD INTERCEPTOR				
MDSDD Central	Activated Sludge	24-147 (3) (170 CAP)	19 (20/30)	19 (20/30)	271 (1000/2000)	0.5 (1.5) (6)	- (-)
Coors	Activated Sludge	3.20 (6.5 CAP)	12.3 (4) 20(Daily Avg)	560 (5) (2650/3975)	236 (1000/2000)	0.48 (0.05) (4)	1.18 (3.0)
Crestview	Trickling Filter	0.8 (1.0 CAP)	LAST OPERATED IN 1977				

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(1) a-b Indicates Avg. to Maximum Monthly Quality Data, Unless Noted Otherwide

(2) (c/d) Indicates Monthly and Weekly Averages

(6) Max. 2-Hour Sample

(3) e-f Indicates Clear Creek Interceptor and Total MDSDD Plant Flow

(4) BOD and Cl_2 Limits for Discharge to Clear Creek

(5) lb/day TSS; (Daily Avg./Instantaneous)

8

TABLE 2-2

Cotter Corporation
Schwartzwalder Mine
Effluent Discharge Quality - 1979(1)

	Permit Limits		Effluent Quality
	Avg.	Max.	Average
Flow, MGD	-	-	0.56
BOD	10	15	11
TSS	20	30	14
Tot. Iron	0.5	1.0	0.74
Tot. Manganese	0.05	0.1	0.07
Tot. Uranium	3.0	5.0	2.18
Tot. Lead	0.05	0.1	0.04
Tot. Zinc	0.5	1.0	0.02
Tot. Barium	1.0	2.0	0.11
Tot. Cadmium	1.0	2.0	0.01
Tot. Arsenic	0.05	0.1	0.01
Oil & Grease	-	10	0
Radium, pCi/l	3	10	2.2
Fecal Coliform(2) #/100ml	1000	2000	40

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(1) All in mg/l except as noted

(2) Permit limits are 30-day avg. & 7-day avg.

	Mass Limits, lb/day	Concentration Limits, mg/l
BOD	2650/3975 (Daily max./Inst.)	30/45 (30-day avg./7-day avg.)
Cl_2	---	0.5 (maximum)

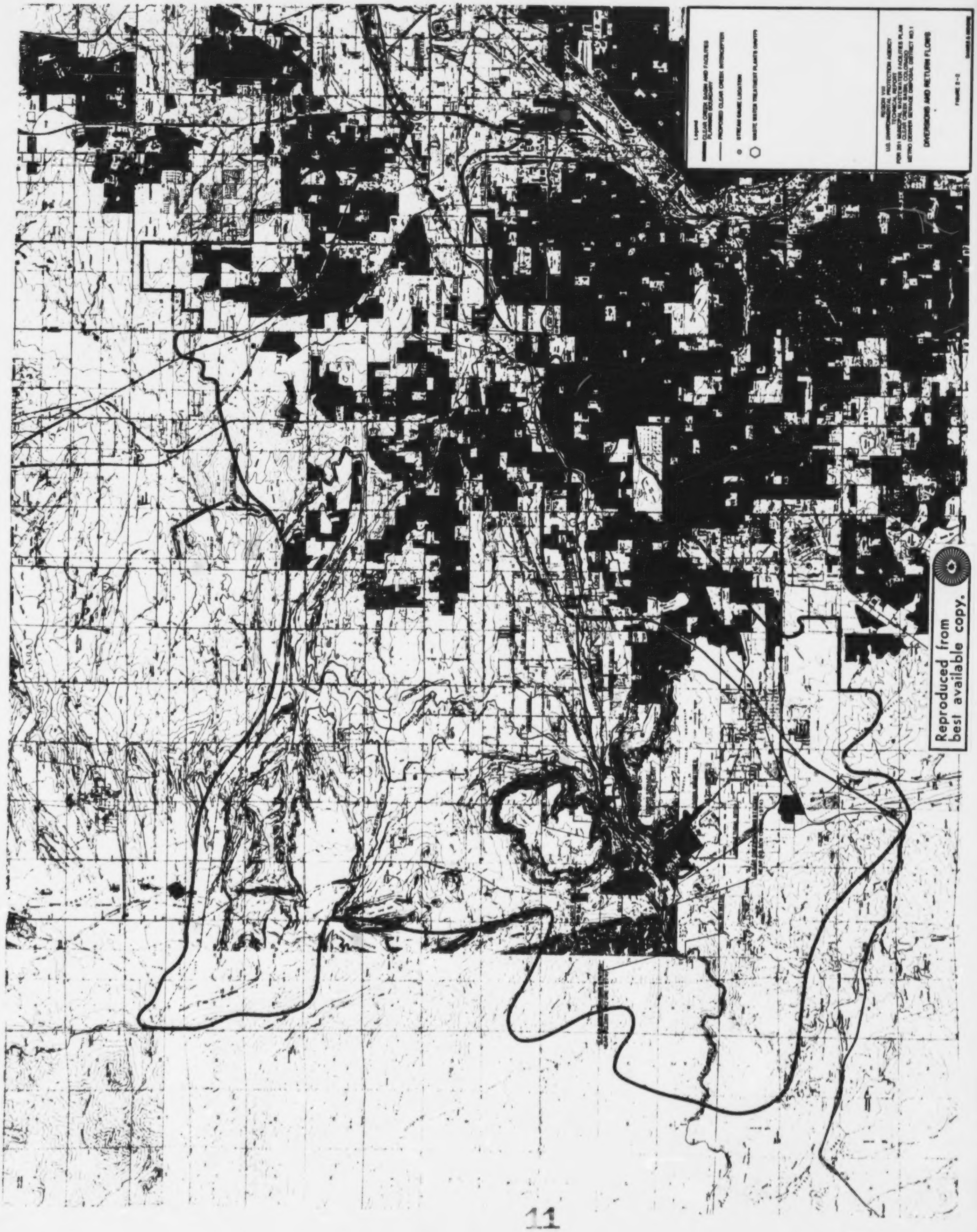
One new plant is now being constructed in the basin by Coors. This will be a new process WWTP, located less than 1 mile east of the existing plant, and discharging at the same two points as the existing plant. This plant will be sized for an average flow of about 6.0 MGD (Holmer, 1980); based on projections of production, the plant will be at or slightly above this level in the year 2000 (Jaquet, 1980). Information on treatment requirements for this plant are not available to date, and will depend on the final content of revisions to the Colorado water quality standards now under consideration (see Section 4.4).

2.2 WATER RIGHTS

2.2.1 Diversion Facilities

Between the Welch Ditch headgate, which is located one mile upstream of the Clear Creek near Golden U.S.G.S. gaging station, and the confluence of Clear Creek and the South Platte River, there have historically been approximately 24 headgates through which stream flows have been diverted. The general alignment and location of the ditches and headgates are shown on Figure 2-2.

Each of the ditches has its own unique characteristics which make it different from any other ditch on the stream. The Welch Ditch and the Agricultural Ditch are both administered by the Agricultural Ditch and Reservoir Company (Neill, 1980). In addition to using the direct flow water associated with each of the two ditch headgates, the ditch company receives water from several reservoirs which are located further upstream. These reservoirs are Loch Lomond, Lake Carolyn, Twin Lakes, Ice Lake, Ohman Lake, Chinns Lake, Upper Chinns Lake, and Wild River Reservoir (Consolidated case No.'s W-8036(75) and W-8256(76), 1977).


Legend
CLEAR CREEK BASIN AND FACILITIES PLANNING BOUNDARY
PROPOSED CLEAR CREEK INTERCEPTER
STREAM GAGE LOCATION
WASTE WATER TREATMENT PLANTS (WWTP)

REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL REPORT
FOR 201 MUNICIPAL WASTEWATER FACILITIES PLAN
CLEAR CREEK BASIN, COLORADO
METRO DENVER SEWAGE DISPOSAL DISTRICT NO. 1

DIVERSIONS AND RETURN FLOWS

FIGURE 2-2

Reproduced from best available copy.

Diversions of the Church Ditch and the City of Golden are taken out of the Church Ditch headgate, however, City of Golden water is separated from the Church Ditch water almost immediately downstream. The Church Ditch is a carrier ditch now owned by the City of Northglenn. In addition to supplying water to agricultural users, the ditch structure is used by various municipalities for delivering water to Standley Reservoir. The ditch officially ends near 100th and Simms at what is called the Ketner Weir. Downstream of the Ketner Weir is the Dry Creek Valley Ditch which is entitled to receive 58% of the Church Ditch water (Vukelich, 1980). At the point where the Dry Creek Valley Ditch crosses Walnut Creek there is a take out for another ditch called the Equity Ditch. The Equity Ditch is entitled to 11.6 % of the Church Ditch water. The 11.6% is included in the 58% allocated to Dry Creek Valley Ditch. The Dry Creek Valley Ditch eventually empties into the Community Ditch, which is part of Farmer's Reservoir and Irrigation Company's (FRICO) Marshall Division. The Community Ditch is entitled to 8% of the water diverted at the Church Ditch headgate (Sauer, 1980).

The Farmers Highline Canal is officially organized as the Farmers Highline Canal and Reservoir Company. Reservoirs owned by the company are Leyden Reservoir and Hiatt Reservoir. In addition, there are approximately 80 small individually-owned reservoirs or holding ponds which are used to store fluctuating flows received from the canal for future use. This canal is also unusual in that, even though it is a mutual ditch company, some of the water rights that are decreed at the canal's headgate are not owned by all the shareholders within the company. Some of the water was given out to ownership under schedule rights, and some of the water is what is called contract water. Contract water is served to a small area in the upper part of the system in which the water rights are attached to the land as part of the water rights decrees. These priorities of the contract water are senior so that lands associated with these rights always have a good water supply. Schedule rights are also attached to specific parcels of land, but share equally in the water diverted in association with the ditch company's headgate decree with the rest of the ditch and reservoir company, up to a cutoff date. This canal also has the ability to deliver water to Standley Reservoir (Anderson, 1975; Dirrim, 1980).

The Croke Canal is the official feeder ditch for Standley Reservoir. Both facilities are owned by FRICO. There is no irrigation at all between Clear Creek and Standley Reservoir, so all of the water that is delivered or diverted by the Croke Canal is delivered to lands which lie outside the Clear Creek basin. These lands are all in the Dry Creek Basin north of Clear Creek (Zeigler, 1980; Bolander, 1980).

The Coors Industries Ditch, Wannamaker Ditch, Rocky Mountain Ditch, Miles and Eskin's Ditch, Lee, Stewart and Eskin's Ditch, and South Side Ditch are all associated with the Adolph Coors Company, although Wannamaker Ditch and Lee, Stewart and Eskin's Ditch have other shareholders who use water for agricultural and municipal purposes. The Coors Industries Ditch is used for diverting cooling water only. The Rocky Mountain Ditch, Wannamaker Ditch and Miles and Eskin's Ditch structures are used by Coors to fill its Jefferson Storage System. The Jefferson Storage System is made up of several gravel pits which lie downstream of the Coors plant. Water is diverted into the reservoir system under their own junior decree or the 1962 decree for the Coors Industries Ditch or by exchange. The exchange is discussed in Section 2.2.3. The Miles and Eskin's water right has been transfered to the Rocky Mountain Ditch headgate by Coors and is used to irrigate the Applewood Gold Course. The South Side Ditch is used for replacement water only. Coors is the operator of the Lee, Stewart and Eskins Ditch, however, this ditch is not put to any special use as are the others associated with Coors (Griggs, 1980; Jaquet, 1980).

The Reno and Juchem Ditch is officially organized as the Consolidated Juchem Ditch Company. This ditch company is similar to the Farmers Highline, at least according to the City of Arvada, in that all of the water rights associated with the headgate are not shared equally by all of the shareholders. Shareholders of the Consolidated Juchem Ditch Company, other than the City of Arvada, feel that all of the rights are owned in common by all shareholders (Sullivan, 1980).

The Slough Association is not really an association at all; rather, it is a carrier ditch for several ditch companies. There are 20 ditches diverting water from the main Slough Ditch. All of these ditches are fairly small and to some degree unorganized. This association has been administered, for many years, as one entity. However, in 1978, the State Engineer started monitoring the amount of water that was diverted by each ditch individually (Rock, 1980; Anderson, 1980).

The Cort, Graves and Hughes Ditch, Boyles Ditch, Oulette Ditch and Kershaw Ditch are all small ditches with just a few water users. The Kershaw Ditch, along with the Manhart Ditch on Ralston Creek provides water for the Crestview Water and Sanitation District (Spano, 1980; Boyce, 1980; Heckers, 1980).

The Fisher Ditch Company is another ditch company that diverts water not only for itself but for another company. The ditch officially ends at Copeland Lake located just east of I-25. At this point, United Water Company takes over administration of Fisher Ditch water and is entitled to 44.9% of the water diverted at the Fisher Ditch headgate. United Water Company also picks up the tail water from the north branch of the Rocky Mountain Ditch at Dewey Lake. However, United Water Company is not officially entitled to any share of the Rocky Mountain Ditch water (Firole, 1980; Gaccetta, 1980).

The Colorado Agricultural Ditch Company and the Clear Creek and Platte River Ditch Company both take water through the same headgate. However, shortly downstream the Colorado Agricultural Ditch takes off from the Clear Creek and Platte River Ditch. The ditches closely parallel each other and serve approximately the same lands (Rullo, 1980; Fukaye, 1980).

The Welch Ditch, Agricultural Ditch, Church Ditch, Farmers Highline Canal, Rocky Mountain Ditch, Fisher Ditch, Colorado Agricultural Ditch, and the Clear Creek and Platte River Ditch all deliver water to lands which lie both within and outside the Clear Creek Basin boundaries. The Croke Canal delivers water to lands which lie outside Clear Creek Basin exclusively. The rest of the active ditches deliver water to lands which lie completely within Clear Creek basin boundaries. The Lee's Island Ditch, John S. Risdon Ditch, John S. Risdon Seepage Ditch, Ramboz No. 3 Ditch, and Page Ditch, which have been identified in past studies, are no longer active (Anderson, 1980).

The only major municipal or industrial user which has any wells located in the Clear Creek alluvium is the Adolph Coors Company. Coors has approximately 49 alluvial wells located in the stretch of Clear Creek between the upstream end of the Coors plant and the point where Clear Creek crosses underneath Interstate 70 at Youngfield. There are plans to locate another 23 wells in this same stretch of streambed. All of the present and future wells are covered in the Coors plan of augmentation (Consolidated Case No.'s W-8036(75) and W-8256(76), 1977).

2.2.2 Diversions and Use

In the State of Colorado the distribution of water is governed by the "prior appropriation" doctrine. This doctrine states that the first diverter of water in a stream system has a prior or "senior" right to the use of water, during periods of scarcity, over later diverters. Thus, in any given stream system, water rights are rated according to their priority or order of first use. When a water user with a more senior priority is not receiving its full allocated water supply as a result of another diverter further upstream with a more junior priority diverting the available water, the senior diverter will "call" for his allocated share. When this happens the junior appropriator is legally obligated to pass the amount of water called for downstream to the senior appropriator. The call that is being exercised on the stream at any given time is usually referred to by the name of the structure for which the water is being called and the point in time when the water right associated with the structure was first used.

In the Clear Creek Basin, there is one call or another on the stream throughout most of the year. During the winter time, the Croke Canal puts its 1902 call on the creek and dries up the creek at its headgate. During the early spring runoff, the call on the lower end of Clear Creek is usually junior to the 1902 Croke call and originates from a diverter on the mainstream South Platte River. Near the end of June, the Farmers Highline Canal normally calls for its 1872 water. From the end of June to early August, the calls rapidly progress through the Welch 71, Colorado Agricultural 67, Colorado Agricultural 63, Fisher 61 and Clear Creek and Platte River 61 call. The Fisher 61 and Clear Creek and Platte River 61 calls are normally on the river during the months of August, September, and October. During these months there is an unusual situation on Clear Creek in that the calls of various structures on the stream become more senior as one progresses upstream. The call emanating from the Rocky Mountain Ditch (Miles and Eskins 6-11-1861 right) is senior to that of the Fisher Ditch (6-29-1861 right) which is in turn senior to that of the Clear Creek and Platte River Ditch (11-1-1861 right).

As a result, during this time period, the creek is dried up at the Rocky Mountain Ditch headgate, the Slough Association headgate, the Fisher Ditch headgate and the Clear Creek and Platte River headgate. The Slough Association has some 1860 rights which allow it to call out more senior rights such as those owned by the Rocky Mountain Ditch Company. However, since there is enough return flow between the Rocky Mountain and the Slough to satisfy the Slough, it does not need to do so. This phenomenon occurs at other points along the stream such as at the Oulette Ditch, Cort, Graves and Hughes Ditch and Kershaw Ditch headgates. During the dryer years, the calls become more senior and the senior calls appear earlier (Anderson, 1980).

2.2.3 Metamorphosis of Diversion Pattern

In the late 1800's, agriculture and grazing were established over large areas of the plains and lower portions of the Clear Creek basin. Irrigation canals were constructed to deliver water to thousands of acres of irrigated farm land. Following the second World War in the early 50's, urbanization, rapidly expanded and was accompanied by some industrialization. But urbanization and industrialization today heavily impact the lower basin as Golden, Arvada, Northglenn, Westminster, Thornton and the other western suburbs of Denver continue to grow and expand. This has a direct effect on the water rights in Clear Creek basin in that many of the lands that were once irrigated are taken out of agricultural production and many of the water rights that were once used for irrigation have been purchased by municipal and industrial users (Sullivan, 1980).

One can see by examining Table 2-3 that very few of the ditches within the Clear Creek basin have been untouched by municipal and industrial interests. According to this exhibit, almost all of the ditches are anywhere from 30 to 100% owned by either municipal or industrial entities. The only major ditch that has remained unaffected is the Welch Ditch.

Before any of the municipal and industrial users are able to change the point of use and type of use from what has historically been associated with their share of the Clear Creek ditches they must demonstrate to all objectors and the Water Courts that such a change in point and type of use will not cause any adverse impact on other water rights that depend on Clear Creek waters as a source of supply. In order to eliminate adverse impacts, all water transfers include a clause which limits future beneficial use to that which has been associated with the rights historically. In addition, the entities are required to make up return flows that resulted from historical irrigation practices in quantity, place and time that they historically occured. The vehicle used for assuring that such make up water is available is normally called a plan for augmentation. Coors and Westminster already have plans of augmentation approved for most of their interest in the Clear Creek while Arvada, Northglenn and Thornton are in the process of obtaining that approval. The proposed uses and plans are described below.

TABLE NO. 2-3

CLEAR CREEK DITCHES

MUNICIPAL AND MAJOR INDUSTRIAL OWNERSHIP
(percent)

	Welch	Church	City of Golden	Agricultural
Golden[1]	0	1.1	100	0
Arvada[2]	0	Negligible	0	0
Westminster[3]	0	9.8	0	0
Northglenn[4]	0	7.3	0	0
Thornton	0	0.3[11]	0	0
Broomfield[5]	0	29.4	0	0
Wheat Ridge[6]	0	0	0	0
Consolidated Mutual[7]	2.5	0	0	33.9
Crestview W&S[8]	0	0	0	0
Adams County	0	0	0	0
Subtotal	2.5	47.9	0	33.9
Coors[9]	0	2.23	0	12.9
PSCo[10]	0	0	0	0
Subtotal	0	2.23	0	12.9
TOTAL	2.5	50.13	100	46.8

TABLE NO. 2-3
(Continued)
CLEAR CREEK DITCHES

MUNICIPAL AND MAJOR INDUSTRIAL OWNERSHIP - CONTINUED
(percent)

	Coors Industries	Farmers Highline	Wannamaker	Lee, Stewart and Eskins	Croke
Golden	0	0	0	0	0
Arvada	0	4.0	0	0	0
Westminster	0	25.4[12]	0	0	31.0[13]
Northglenn	0	0.7	0	0	
Thornton	0	10.7[11]	0	0	
Broomfield	0	0	0	0	0
Wheat Ridge	0	0	0	0	0
Consolidated Mutual	0	0	0	50.2	0
Crestview W&S	0	0	0	0	0
Adams County	0	0	0	0	0
Subtotal	0	40.8	0	50.2	0
Coors	100	1.9	56.7	19.4	0
PSCo	0	0	0	0	0
Subtotal	100	1.9	56.7	19.4	0
TOTAL	100	42.7	56.7	69.6	31.0

TABLE NO. 2-3
(Continued)
CLEAR CREEK DITCHES

MUNICIPAL AND MAJOR INDUSTRIAL OWNERSHIP - CONTINUED
(percent)

	Rocky Mountain	Miles & Eskins	Reno & Juchem	Slough Association
Golden	0	0	0	0
Arvada	0	0	37.1	12.5
Westminster	0	0	0	0
Northglenn	0	0	0	0
Thornton	0	0	0	0
Broomfield	0	0	0	0
Wheat Ridge	0	0	0	0
Consolidated Mutual	0.6	0	0	0
Crestview W&S	0	0	0	0
Adams County	0	0	0	0
Subtotal	0.6	0	37.1	12.5
Coors	71.4	100	8.8	14.3
PSCo	0	0	0	0
Subtotal	71.4	100	8.8	14.3
TOTAL	72.0	100	45.9	26.8

TABLE NO. 2-3
(Continued)
CLEAR CREEK DITCHES

MUNICIPAL AND MAJOR INDUSTRIAL OWNERSHIP - CONTINUED
(percent)

	Oulette	Southside	Cort, Graves & Hughes	Boyles
Golden	0	0	0	0
Arvada	0	0	1.8	0
Westminster	0	0	0	0
Northglenn	0	0	0	0
Thornton	0	0	0	0
Broomfield	0	0	0	0
Wheat Ridge	33.3	0	0	0
Consolidated Mutual	0	0	0	0
Crestview W&S	0	0	0	0
Adams County	0	0	0	0
Subtotal	33.3	0	1.8	0
Coors	0	100	0	0
PSCo	0	0	0	0
Subtotal	0	100	0	0
TOTAL	33.3	100	1.8	0

TABLE NO. 2-3
(Continued)
CLEAR CREEK DITCHES

MUNICIPAL AND MAJOR INDUSTRIAL OWNERSHIP - CONTINUED
(percent)

	Kershaw	Fisher	Colorado Agricultural	Clear Creek & Platte River
Golden	0	0	0	0
Arvada	0	0	0	0
Westminster	0	0	0	0
Northglenn	0	0	0	4.2
Thornton	0	9.4[10]	20.8[14]	29.2[14]
Broomfield	0	0	0	0
Wheat Ridge	0	0	0	0
Consolidated Mutual	0	0	0	0
Crestview W&S	38.0	0	0	0
Adams County	0	0	0	4.2
Subtotal	38.0	9.4	20.8	37.6
Coors	0	0	0	0
PSCo	0	19.4	0	0
Subtotal	0	19.4	0	0
TOTAL	38.0	28.8	20.8	37.6

TABLE NO. 2-3
(Concluded)
FOOTNOTES

[1] (Case No. 79CW236, 1980)

[2] (Sullivan, 1980)

[3] (Case No. W-8743-77, 1980)

[4] (U. S. Environmental Protection Agency, 1980)

[5] (Sauer, 1980)

[6] (Heckers, 1980)

[7] (Case No. 79CW236, 1980)

[8] (Boyce, 1980)

[9] (Case No. W-7690-74, 1975)(Consolidated Cases
Nos. W-8036(75) and
W-8256(76), 1977)

[10] (Firole, 1980)

[11] (Denver Water Department, 1976 pp. 56-59)

[12] Westminster owns 100% of priorities #1 and #48

[13] (Bolander, 1980)

[14] (Fukay, 1980); (Rullo, 1980)

Arvada plans on putting most of its Clear Creek water into Blunn Reservoir, which is presently being constructed on Ralston Creek. They plan to accomplish this by discharging their pro rata shares of Church Ditch and Farmers Highline Canal water into Ralston Creek and re-diverting it at a pump station located near where the Croke Canal crosses Ralston Creek. Arvada's Reno and Juchem and Slough Association water will be diverted in the Croke Canal on an exchange basis and delivered to the pumping station. During the times the Croke Canal is diverting, additional water from Arvada's Reno and Juchem and Slough Association rights will be taken, up to the total of those rights or the remaining flow in the Creek, whichever is less. Arvada will be making up, in the plan of augmentation, any return flow water that would have historically accrued to the stream by the former use of Arvada shares. The plan has the effect of reducing the water flow between the Croke Canal and Slough Association Ditch during those times when water may be exchanged between those two facilities (Sullivan, 1980; Case No. 8083-75, 1975; Case No. W-8762-77, 1977).

Westminster's decreed plan of augmentation and Northglenn's proposed plan of augmentation should affect Clear Creek in about the same manner. Both cities plan on diverting their shares of Church Ditch and Farmers Highline Canal water for delivery to Standley Reservoir. Both cities will be required to return augmentation water to the stream at the headgate to make up for any return flows that would have historically accrued to the river but will no longer be present because of the change in point of use. Clear Creek flows will be slightly increased at the headgates due to the fact that the make up water for these return flows is placed in the creek at one specific point rather than being distributed throughout the reach of the stream as historical return flows would have returned. This statement is not entirely true in Westminster's case in that Westminster is claiming some return flow from lawn irrigation that reaches Clear Creek by way of Little Dry Creek about one-third mile west of Pecos (Case No. W-8743-77, 1980).

Northglenn also plans on implementing an exchange with Farmers Reservoir and Irrigation Company (FRICO). In this exchange Northglenn will use FRICO water stored in Standley Reservoir and replace this water with treated sewage effluent for the benefit of the FRICO shareholders. This exchange will not affect Clear Creek flows or return flows (Case No. 79-CW235, 1979; Case No. 79-CW236, 1979).

Thornton has a proposed plan of augmentation which involves using their rights to Clear Creek and Platte River Ditch water to augment flows in the South Platte River caused by pumping Thornton's South Platte alluvium wells out of priority. This would have the effect of augmenting flow in Clear Creek near the mouth, although no point of return has been established (Case No. W-7851-74, 1974). Thornton also has plans to utilize Standley Reservoir in roughly the same manner as Northglenn and Westminster, although no plan of augmentation has been filed to date.

Coors will be diverting water from their wells for the purpose of using it in their brewing process. The general location of the wellfield is shown in Figure 2-2. Water from the wells leaves the brewery as product. Water from the Jefferson Storage System will be used for domestic use and process water. Coors has a third point of diverson at Coors Industries Ditch. Most of the water diverted at this point is used in the cooling process. All of these water rights are fairly junior. In order to be able to divert water, Coors has developed an augmentation plan which will utilize its ownership in the various ditches on Clear Creek. According to the plan, during times when Coors' water rights are out of priority, Coors will add up all of its diversions associated with the wells, Coors Industries Ditch and the Jefferson Storage System and subtract from this the amount of discharge to Clear Creek from its various cooling water and wastewater return points. The difference will be the amount of water that needs to be replaced by Coors. They will do this by returning to the stream their share of the water diverted by the most senior ditches in which they have ownership. The plan has the effect of increasing flows slightly in Clear Creek in the stretch between the Church Ditch headgate and the Coors Industries Ditch. Between the Coors Industries Ditch and the Slough Association Ditch, creek flows are reduced from historical flows due to increased upstream diversions. Below the Slough Association Ditch, no change is noticeable in the creek (Consolidated Case Nos. W-8036(75) and W-8256(76), 1977).

There are several matters concerning Clear Creek that are presently being litigated. Some of these, such as the Arvada, Northglenn and Westminster plans of augmentation, have been discussed above. In addition, proposed revisions of in-stream water quality standards for Clear Creek discussed in more detail elsewhere in this study, have been reviewed in hearings before the Colorado Water Quality Control Commission during Summer, 1980 (Colorado Department of Health, 1980). Numerous ditch companies and industrial-municipal users are opposing this reclassification for one reason or another. There are other minor disputes on the stream such as the one between Arvada and the Consolidated Reno and Juchem Ditch concerning the structure of the ditch company and one potentially between the City of Golden, Northglenn, Coors and FRICO concerning the ownership of the Berthoud Pass Ditch which diverts western slope Fraser River water to the Clear Creek Basin.

2.3 STREAMFLOWS

The USGS maintains two gaging stations on Clear Creek that relate to this study. The upper station is Clear Creek near Golden and the lower is Clear Creek at mouth near Derby. The locations are presented on Figure 2-2. For the period 1928-1976, the average annual flow at the Golden gage was about 157,000 acre-feet (A-F). The lowest flow of record was 68,200 A-F in 1954; the highest flow was 283,000 A-F in 1957. For the same period of record, the average annual flow at the Derby gage was about 67,000 A-F. The lowest annual flow at Derby was 10,900 A-F in 1954 and the highest was 187,000 A-F in 1965.

The flow in Clear Creek changes considerably in the 17-mile stretch between the gages. Most of the flow reductions that occur are due to the numerous diversion ditches that take water from Clear Creek. Except during periods of high runoff, it is very common for one or more of the various ditches to divert all of the flow in the creek. Due to these diversions, the flow in Clear Creek is an artificial regime; it bears little or no resemblance to natural free-flowing stream conditions.

The operation of wastewater treatment plants (WWTP's) also affects the flows in Clear Creek. Currently, four WWTP's discharge treated effluent into Clear Creek: Coors' process wastewater, Wheat Ridge, Arvada and Clear Creek Valley. Other plants have historically discharged to Clear Creek but now discharge into the existing MDSDD interceptor. It should be noted here that a fifth WWTP, Crestview, discharged treated effluent to Clear Creek through April of 1977, at which time the plant was closed.

To define existing conditions, a monthly water balance was attempted for Clear Creek for the years 1975 and 1977. In 1975, the annual flow past the Golden gage was 153,000 A-F and, therefore, it was considered an average year. In 1977, the annual flow was only 75,500 A-F, the second lowest flow of record. Thus, 1977 was taken as a dry year. The flows passing the Derby gage for 1975 and 1977 were 62,800 A-F and 15,600 A-F, respectively.

The flow information gathered was of three types: diversion records, wastewater flows and Coors flows. Diversion records were obtained from the State Engineer's office. The records were judged to be accurate except as they applied to Coors. Wastewater records were obtained through personal communications and NPDES records. Generally, the wastewater flow records were unavailable on a monthly basis. Incomplete records were estimated by average daily flows as determined by the annual flows.

Flow data for Coors' operations was somewhat difficult to obtain. Prior to mid-1977, flow data for the Coors Industries Ditch (Golden Milling Co. Ditch) was not included in the State Engineer's records. However, under Coors' Plan of Augmentation, Coors provides daily records of all Coors flows to the District No. 7 Water Commissioner. The water rights aspect of Coors' Plan of Augmentation were provided in Section 2.2.

Make-up water that Coors supplies from its water rights in other diversion ditches to offset depletions is handled by an accounting system whereby water that Coors is entitled to at that ditch headgate is effectively left in the stream by diverting it, measuring Coors' portion, and then returning that portion to the stream. This fact complicates the water balance analysis since most of the diversion records available from the State Engineer's office only show total diversions and do not show this return flow.

We have attempted to reduce the complex Coors' data to a form usable in monthly water balances. However, no records are available prior to late 1975 and, therefore, monthly water balances cannot be performed prior to that time. Prior to May of 1977, the Coors' diversions and replacements of cooling waters were not recorded by the Water Commissioner. We have, therefore, had to make estimates for the cooling water diversions based on the available records and from assumed conditions on the stream.

Tables 2-4 and 2-5 show the calculations and flows determined for Clear Creek for the months of January and September of 1977. These months were determined to be the lowest flow conditions of the stream and represent wintertime and late summer/fall irrigation season conditions. Figures 2-3 and 2-4 are a graphical representation of the flow determination for the above two months. The months of August and May represent stream conditions when flow in the stream is higher and are presented in Figures 2-5 and 2-6. Table 2-7 summarizes the flow data used for stream diversions. Table 2-6 summarizes stream return flows, and Table 2-8 shows the recorded monthly stream flows for the year 1977 at the abovementioned stream gages.

A critical low flow of 180 acre-feet or 3 cfs is shown on the flow graphs, Figures 2-3 through 2-6. This figure (3cfs) is shown on the basis that there is a minimum streamflow below which significant impacts on aquatic habitat will occur due to the combined effects of water quality degradation and habitat loss; this minimum flow would have to be

TABLE NO. 2-4
CLEAR CREEK FLOWS
JANUARY , 1977
(All Values In Acre Feet)

STREAM MILE (1)	POINT ON CLEAR CREEK (2)	DISTANCE BETWEEN POINTS (3)	FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN		GAIN IN CREEK FLOW BETWEEN POINTS (6)	DIVERSION FLOW BY DITCHES		RETURN FLOWS		REMAINING FLOW IN CREEK			
										INCLUDING WASTEWATER (a)		WITHOUT WASTEWATER (a)	
			TOTAL FLOW (4)	IMPORTED FLOW (5)		TOTAL DIVERSION (7)	IMPORTED DIVERSION (8)	TOTAL WATER (9)	IMPORTED WATER (10)	TOTAL FLOW (11)	IMPORTED FLOW (12)	TOTAL FLOW (13)	IMPORTED FLOW (14)
18.38	Welch Ditch	.38	2537.0	0	6.5	0	0	-	-	2537.0	0	2537.0	0
18.00	Church Ditch	0	2543.5	0	0	0	0	-	-	2543.5	0	2543.5	0
18.00	City of Golden	.66	2543.5	0	11.3	214.8	0	-	-	2328.7	0	2328.7	0
17.34	USGS Stream Gage	.92	2340.0	0	15.8	-	-	-	-	2340.0	0	2340.0	0
16.42	Agricultural Ditch	.04	2355.8	0	.7	0	0	-	-	2355.8	0	2355.8	0
16.38	Coors Industrial Ditch	.05	2356.5	0	.9	1294.9		-	-	1061.6	0	1061.6	0
16.33	Coors Cooling Return(006)(6)	0	1062.5	0	0	-	-	950.4	0	2012.9	0	2012.9	0
16.33	Farmers Highline Canal	.18	2012.9	0	3.1	0	0	-	-	2012.9	0	2012.9	0
16.15	Coors Cooling Return(008)	.03	2016.0	0	.5	-	-	-	-	2016.0	0	2016.0	0
16.12	Coors Cooling Return(010)	.02	2016.5	0	.3	-	-	-	-	2016.5	0	2016.5	0
16.10	Coors Cooling Return(005)	.16	2016.8	0	2.7	-	-	-	-	2016.8	0	2016.8	0
15.94	Coors Cooling Return(007)	.31	2019.5	0	5.3	-	-	-	-	2019.5	0	2019.5	0
15.63	Wannamaker Ditch	.16	2024.8	0	2.7	165.8	0	-	-	1859.0	0	1859.0	0
15.47	Lee, Stewart & Eskins	.67	1861.7	0	11.5	0	0	-	-	1861.7	0	1861.7	0
14.80	Coors WWTP Return(002A)	0	1873.2	0	0	-	-	370.1	0	2243.3	0	2243.3	0
14.80	Croke Canal	0	2243.3	0	0	2243.3	0	-	-	0	0	0	0
14.80	Rocky Mountain Ditch	1.38	0	0	48.1	0	0	-	-	0	0	0	0

TABLE NO. 2-4 (con't)
CLEAR CREEK FLOWS
JANUARY , 1977
(All Values In Acre Feet)

			FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN			DIVERSION FLOW BY DITCHES		RETURN FLOWS		REMAINING FLOW IN CREEK INCLUDING WASTEWATER (c)		REMAINING FLOW IN CREEK WITHOUT WASTEWATER (c)	
STREAM MILE (1)	POINT ON CLEAR CREEK (2)	DISTANCE BETWEEN POINTS (3)	TOTAL FLOW (4)	IMPORTED FLOW (5)	GAIN IN CREEK FLOW BETWEEN POINTS (6)	TOTAL DIVERSION (7)	IMPORTED DIVERSION (8)	TOTAL WATER (9)	IMPORTED WATER (10)	TOTAL FLOW (11)	IMPORTED FLOW (12)	TOTAL FLOW (13)	IMPORTED FLOW (14)
13.42	Miles & Eskins		4.81	0		48.1	0	-	-	0	0	0	0
		0			0								
13.42	Coors WWTP Return(002)		0	0		-	-	0	0	0	0	0	0
		.46			16.0								
12.96	Reno & Juchem		16.0	0		0	0	-	-	16.0	0	16.0	0
		.74			25.8								
12.22	Slough Association		41.8	0		0	0	-	-	41.8	0	41.8	0
		.87			30.3								
11.35	South Side		72.1	0		61.4	0	-	-	10.7	0	10.7	0
		.10			3.5								
11.25	Oulette		14.2	0		0	0	-	-	14.2	0	14.2	0
		.87			30.3								
10.38	N.W. Lakewood WWTP		44.5	0		-	-	-	-	44.5	0	44.5	0
		.13			4.5								
10.25	Fruitdale WWTP		49.0	0		-	-	-	-	49.0	0	49.0	0
		.64			22.3								
9.61	Lena Gulch		71.3	0	46.0	-	-	-	-	117.3	0	117.3	0
		1.41			25.9								
8.20	Cott, Graves & Hughes		143.2	0		0	0	-	-	143.2	0	143.2	0
		.70			12.8								
7.50	Wheat Ridge WWTP		156.0	0		-	-	251.1	251.1	407.1	251.1	407.1	0
		.80			14.7								
6.70	Clear Creek Val. WWTP		421.8	251.1		-	-	152.0	152.0	573.8	403.1	573.8	0
		.37			6.8								
6.33	Arvada WWTP		580.6	403.1		-	-	76.9	76.9	657.5	480.0	657.5	0
		0			0								
6.33	Ralston Creek		657.5	480.0	350.0	-	-	-	-	1007.5	480.0	1007.5	0
		.10			3.1								
6.23	Boyles		1010.6	480.0		0	0	-	-	1010.6	480.0	1010.6	0
		.05			1.6								
6.18	Kershaw Ditch		1012.2	480.0		0	0	-	-	1012.2	480.0	1012.2	0
		.90			28.0								

TABLE NO. 2-4 (concluded)
CLEAR CREEK FLOWS
JANUARY , 1977
(All Values In Acre Feet)

STREAM MILE (1)	POINT ON CLEAR CREEK (2)	DISTANCE BETWEEN POINTS (3)	FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN TOTAL FLOW (4)	FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN IMPORTED FLOW (5)	GAIN IN CREEK FLOW BETWEEN POINTS (6)	DIVERSION FLOW BY DITCHES TOTAL DIVERSION (7)	DIVERSION FLOW BY DITCHES IMPORTED DIVERSION (8)	RETURN FLOWS TOTAL WATER (9)	RETURN FLOWS IMPORTED WATER (10)	REMAINING FLOW IN CREEK INCLUDING WASTEWATER TOTAL FLOW (11)	REMAINING FLOW IN CREEK INCLUDING WASTEWATER IMPORTED FLOW (12)	REMAINING FLOW IN CREEK WITHOUT WASTEWATER TOTAL FLOW (13)	REMAINING FLOW IN CREEK WITHOUT WASTEWATER IMPORTED FLOW (14)
5.28	Fisher Ditch		1040.2	480.0		399.0	0	-	-	641.2	480.0	161.2	0
3.69	Westminster WWTP	1.59	690.6	480.0	49.4	-	-	-	-	690.6	480.0	210.6	0
3.69	Little Dry Creek	0	690.6	480.0	0 70.0	-	-	-	-	760.5	480.0	280.5	0
3.25	Western Paving	.44	774.3	480.0	13.7	-	-	1.9	0	776.2	480.0	296.2	0
3.24	Crestview WWTP	.01	776.5	480.0	.3	-	-	64.8	0	841.3	480.0	361.3	0
3.03	Colorado Ag. Ditch	.21	847.8	480.0	6.5	0	0	-	-	847.8	480.0	367.3	0
3.03	Clear Creek & Platte R. Ditch	0	847.8	480.0	0	0	0	-	-	847.8	480.0	367.8	0
.52	U.S.G.S. Stream Gage	2.51	926	480.0	78.0	-	-	-	-	926	480.0	446.0	0
0	South Platte River	.52	942.2	480.0	16.2	-	-	-	-	942.2	480.0	462.2	0
	Totals				965.1	4427.3	0	1867.2					

Apparent gain between stream gages - 931.3 AF

(a) Indicates wastewater from Arvada, Wheat Ridge and Clear Creek Valley plants
(b) Indicates NPDES permit discharge point

TABLE NO. 2-5
CLEAR CREEK FLOWS
SEPTEMBER , 1977
(All Values In Acre Feet)

			FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN			DIVERSION FLOW BY DITCHES		RETURN FLOWS		REMAINING FLOW IN CREEK			
										INCLUDING WASTEWATER		WITHOUT WASTEWATER	
STREAM MILE (1)	POINT ON CLEAR CREEK (2)	DISTANCE BETWEEN POINTS (3)	TOTAL FLOW (4)	IMPORTED FLOW (5)	GAIN IN CREEK FLOW BETWEEN POINTS (6)	TOTAL DIVERSION (7)	IMPORTED DIVERSION (8)	TOTAL WATER (9)	IMPORTED WATER (10)	TOTAL FLOW (11)	IMPORTED FLOW (12)	TOTAL FLOW (13)	IMPORTED FLOW (14)
18.38	Welch Ditch	.38	4975.3	712.8	10.8	0	0	-	-	4975.3	712.8	4975.3	712.8
18.00	Church Ditch	0	4986.1	712.8	0	0	0	-	-	4986.1	712.8	4986.1	712.8
18.00	City of Golden	.66	4986.1	712.8	18.7	314.8	0	-	-	4671.3	712.8	4671.3	712.8
17.34	USGS Stream Gage	.92	4690	712.8	26.1	-	-	-	-	4690.0	712.8	4690.0	712.8
16.42	Agricultural Ditch	.04	4716.1	712.8	1.1	1118.7	712.8	49.4	-	3646.8	0	3646.8	0
16.38	Coors Industrial Ditch	(b) .05	3647.9	0	1.4	2371.3	0	-	-	1276.6	0	1276.6	0
16.33	Coors Cooling Return(006)	0	1278.0	0	0	-	-	2559.5	0	3837.5	0	3837.5	0
16.33	Farmers Highline Canal	.18	3837.5	0	5.1	2393.8	0	29.2	-	1472.9	0	1472.9	0
16.15	Coors Cooling Return(008)	.03	1478.0	0	.9	-	-	-	0	1478.0	0	1478.0	0
16.12	Coors Cooling Return(010)	.02	1478.9	0	.6	-	-	-	0	1478.9	0	1478.0	0
16.10	Coors Cooling Return (005)	.16	1479.5	0	4.5	-	-	-	0	1479.5	0	1479.5	0
15.94	Coors Cooling Return(007)	.31	1484.0	0	8.8	-	-	-	0	1484.0	0	1484.0	0
15.63	Wannamaker Ditch	.16	1492.8	0	4.5	556.8	0	160.6	-	1096.6	0	1096.6	0
15.47	Lee, Stewart & Eskins	.67	1101.1	0	19.0	176.6	0	-	-	924.5	0	924.5	0
14.80	Coors WWTP Return(002A)	0	943.5	0	0	-	-	0	0	943.5	0	943.5	0
14.80	Croke Canal	0	943.5	0	0	0	0	-	-	943.5	0	943.5	0
14.80	Rocky Mountain Ditch		943.5	0		558.6	0	-	-	384.9	0	384.9	0
		1.38			74.2								

TABLE NO. 2-5 (con't.)
CLEAR CREEK FLOWS
SEPTEMBER , 1977
(All Values In Acre Feet)

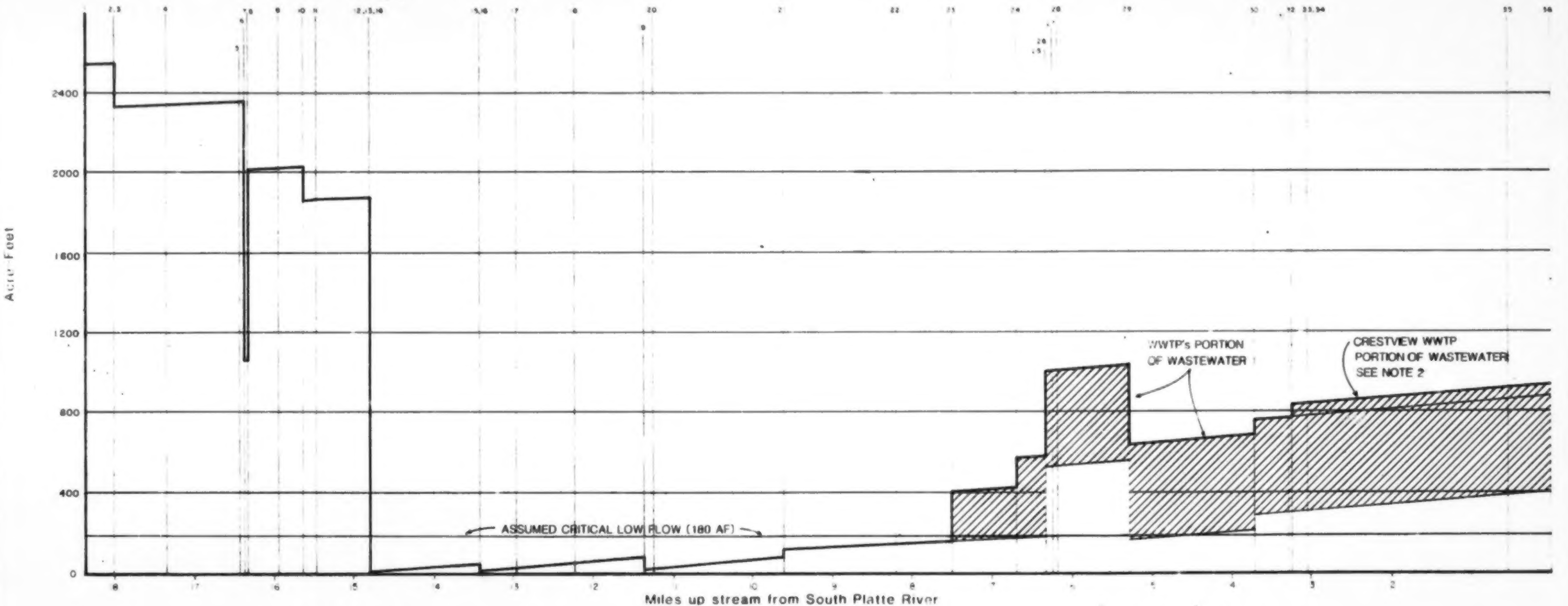
			FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN			DIVERSION FLOW BY DITCHES		RETURN FLOWS		REMAINING FLOW IN CREEK			
										INCLUDING WASTEWATER		WITHOUT WASTEWATER	
STREAM MILE (1)	POINT ON CLEAR CREEK (2)	DISTANCE BETWEEN POINTS (3)	TOTAL FLOW (4)	IMPORTED FLOW (5)	GAIN IN CREEK FLOW BETWEEN POINTS (6)	TOTAL DIVERSION (7)	IMPORTED DIVERSION (8)	TOTAL WATER (9)	IMPORTED WATER (10)	TOTAL FLOW (11)	IMPORTED FLOW (12)	TOTAL FLOW (13)	IMPORTED FLOW (14)
13.42	Miles & Eakins	0	459.1	0	0	218.3	0	-	-	240.8	0	240.8	0
13.42	Coors WWTP Return(002)	.46	240.8	0	24.7	-	-	298.7	0	539.5	0	539.5	0
12.96	Reno & Juchem	.74	564.2	0	33.8	0	0	-	-	564.2	0	564.2	0
12.22	Slough Association	.87	604.0	0	46.8	534.6	0	-	-	69.4	0	69.4	0
11.35	South Side	.10	116.2	0	5.4	0	0	-	-	116.2	0	116.2	0
11.25	Oulette	.87	121.6	0	46.8	118.8	0	-	-	2.8	0	2.8	0
10.38	N.W. Lakewood WWTP	.13	49.6	0	7.0	-	-	-	-	49.6	0	49.6	0
10.25	Fruidale WWTP	.64	56.6	0	34.4	-	-	-	-	56.6	0	56.6	0
9.61	Lena Gulch	1.41	91.0	0	61.7 42.8	-	-	-	-	152.7	0	152.7	0
8.20	Cort, Graves & Hughes	.70	195.5	0	21.3	119.8	0	-	-	75.7	0	75.7	0
7.50	Wheat Ridge WWTP	.80	97.0	0	24.3	-	-	204.0	204.0	301.0	204.0	97	0
6.70	Clear Crk. Val. WWTP	.37	325.3	204.0	11.2	-	-	147.1	147.1	472.4	351.1	121.3	0
6.33	Arvada WWTP	0	483.6	351.1	0	-	-	74.4	74.4	558.0	425.5	132.5	0
6.33	Ralston Creek	.10	558.0	425.5	478.8 5.5	-	-	-	-	1036.8	425.5	617.4	0
6.23	Boyles	.05	1042.3	425.5	2.8	0	0	-	-	1042.3	425.5	622.9	0
6.18	Kershaw Ditch	.90	1045.1	425.5	49.5	615.8	0	-	-	429.3	425.5	9.9	0

TABLE NO. 2-5 (concluded)
CLEAR CREEK FLOWS
SEPTEMBER , 1977
(All Values In Acre Feet)

			FLOW IN CREEK BEFORE DIVERSIONS OR WASTEWATER RETURN			DIVERSION FLOW BY DITCHES		RETURN FLOWS		REMAINING FLOW IN CREEK INCLUDING WASTEWATER		REMAINING FLOW IN CREEK WITHOUT WASTEWATER	
STREAM MILE (1)	POINT ON CLEAR CREEK (2)	DISTANCE BETWEEN POINTS (3)	TOTAL FLOW (4)	IMPORTED FLOW (5)	GAIN IN CREEK FLOW BETWEEN POINTS (6)	TOTAL DIVERSION (7)	IMPORTED DIVERSION (8)	TOTAL WATER (9)	IMPORTED WATER (10)	TOTAL FLOW (11)	IMPORTED FLOW (12)	TOTAL FLOW (13)	IMPORTED FLOW (14)
5.28	Fisher Ditch		478.8			316.8	0	-	-	162.0	162.0	-257.4 0	0
		1.59			87.5								
3.69	Westminster WWTP		249.5			-	-	-	-	249.5	162.0	87.5	0
		0			0								
3.69	Little Dry Creek		249.5		92.6	-	-	-	-	342.1	162.0	180.1	0
		.44			24.2								
3.25	Western Paving		366.3			-	-	0	0	366.3	162.0	204.3	0
		.01			.6								
3.24	Crestview WWTP		366.9			-	-	-	-	366.9	162.0	204.9	0
		.21			11.6								
3.03	Colorado Ag. Ditch		378.5			0	0	-	-	378.5	162.0	216.5	0
		0			0								
3.03	Clear Creek & Platte R. D.		378.5			378.2	0	-	-	.3	.3	-161.7 0	0
		2.51			138.0								
.52	USGS Stream Gage		138			-	-	-	-	138.0	.3	138.0	0
		.52			23.6								
0	South Platte River		166.6			-	-	-	-	166.6	.3	166.6	0
				Totals	1600.1	9792.9	712.8	3522.9					

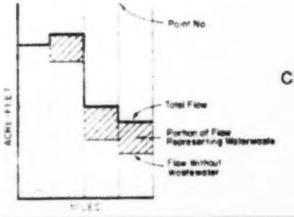
Apparent Gain Between Stream Gages = 1403

(a) Wastewater refers to existing Arvada, Wheat Ridge, and Clear Creek Valley plants.
(b) Indicates NPDES permit discharge point.



1	WELCH DITCH
2	CHURCH DITCH
3	CITY OF GOLDEN
4	USGS STREAM GAGE
5	AGRICULTURAL DITCH
6	COORS INDUSTRIAL DITCH
7	COORS COOLING RETURN
8	FARMERS HIGHLING CANAL
9	COORS COOLING RETURN
10	WANNEMAKER DITCH
11	LEE, STEWART & ESKINS
12	COORS WWTP RETURN
13	CROKE CANAL
14	ROCKY MOUNTAIN DITCH
15	MILES & ESKINS
16	COORS WWTP RETURN
17	RENO & JUCHEM
18	SLOUGH ASSOCIATION
19	SOUTH SIDE
20	OULETTE
21	LENA GULCH
22	CORT, GRAVES & HUGHES
23	WHEAT RIDGE WWTP
24	CLEAR CREEK VAL. WWTP
25	ARVADA WWTP
26	RALSTON CREEK
27	BOYLES
28	KERSHAW DITCH
29	FISHER DITCH
30	LITTLE DRY CREEK
31	WESTERN PAVING
32	CRESTVIEW WWTP
33	COLORADO AG. DITCH
34	CLEAR CREEK & PLATTE RIVER
35	USGS STREAM GAGE
36	SOUTH PLATTE RIVER

NOTES:
1. WWTP'S REFERS TO THE WHEATRIDGE. CLEAR CREEK VALLEY AND ARVADA WASTEWATER TREATMENT PLANTS
2. CRESTVIEW WASTEWATER TREATMENT PLANT CLOSED IN MAY, 1977


ACRE-FEET
MILES
Point No
Total Flow
Portion of Flow Representing Wastewater
Flow Without Wastewater

CLEAR CREEK FLOWS

JANUARY 1977

FIGURE 2-3

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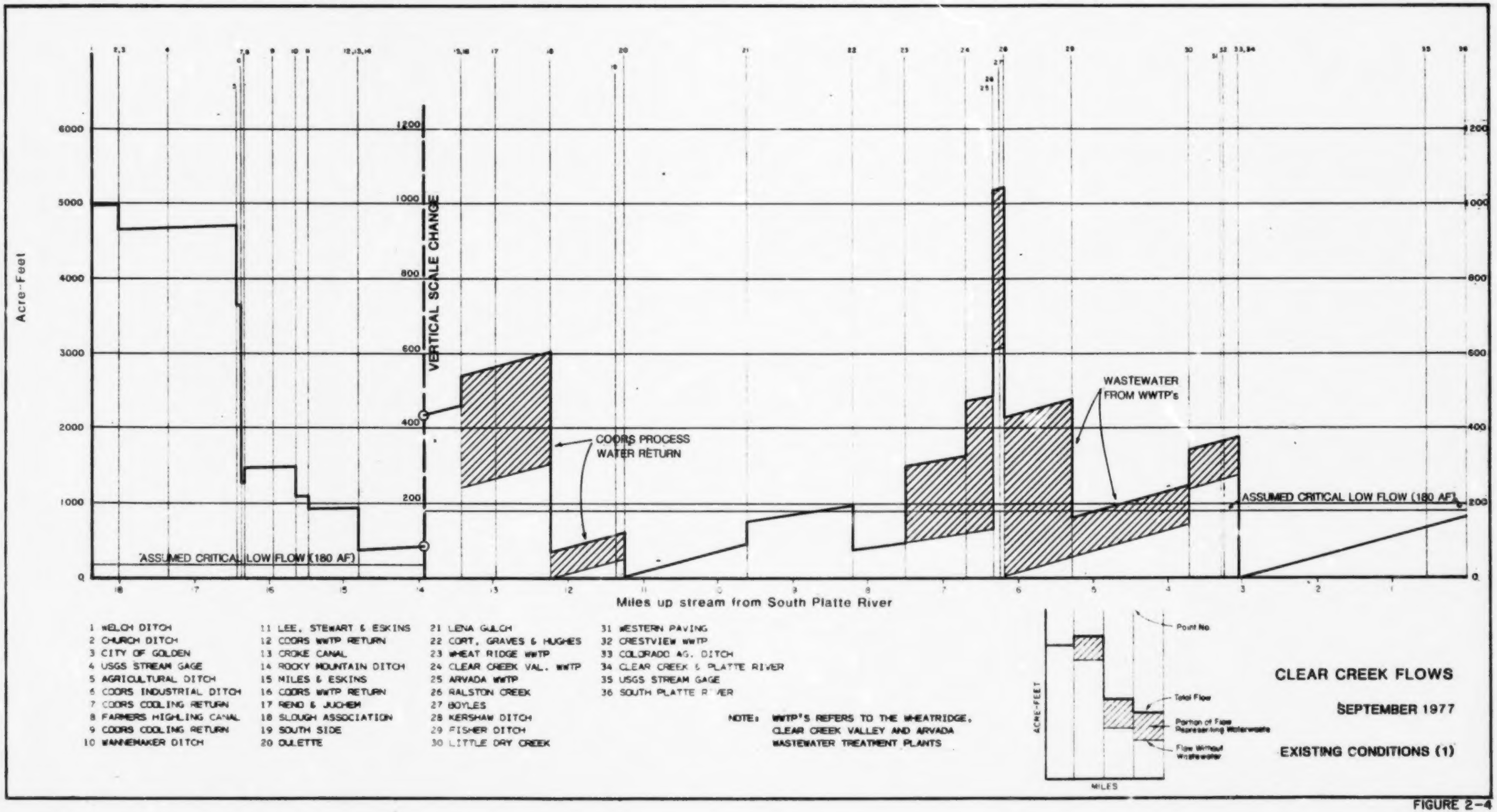


1 WELCH DITCH
2 CHURCH DITCH
3 CITY OF GOLDEN
4 USGS STREAM GAGE
5 AGRICULTURAL DITCH
6 COORS INDUSTRIAL DITCH
7 COORS COOLING RETURN
8 FARMERS HIGHLING CANAL
9 COORS COOLING RETURN
10 WANNEMAKER DITCH
11 LEE, STEWART & ESKINS
12 COORS WWTP RETURN
13 CROKE CANAL
14 ROCKY MOUNTAIN DITCH
15 MILES & ESKINS
16 COORS WWTP RETURN
17 RENO & JUCHEM
18 SLOUGH ASSOCIATION
19 SOUTH SIDE
20 OULETTE
21 LENA GULCH
22 CORT, GRAVES & HUGHES
23 WHEAT RIDGE WWTP
24 CLEAR CREEK VAL. WWTP
25 ARVADA WWTP
26 RALSTON CREEK
27 BOYLES
28 KERSHAW DITCH
29 FISHER DITCH
30 LITTLE DRY CREEK
31 WESTERN PAVING
32 CRESTVIEW WWTP
33 COLORADO AG. DITCH
34 CLEAR CREEK & PLATTE RIVER
35 USGS STREAM GAGE
36 SOUTH PLATTE RIVER

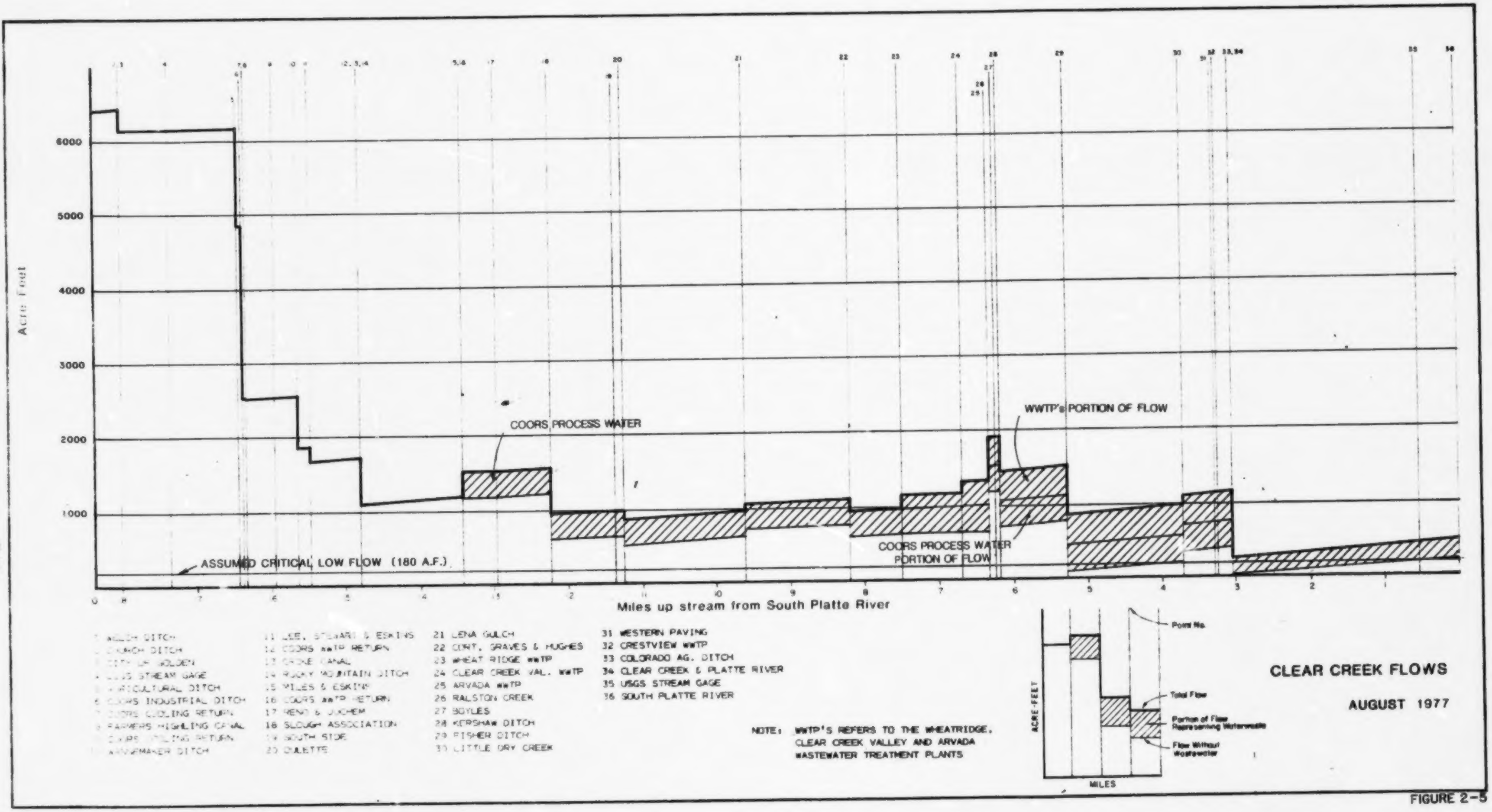
NOTE: WWTP'S REFERS TO THE WHEATRIDGE, CLEAR CREEK VALLEY AND ARVADA WASTEWATER TREATMENT PLANTS

CLEAR CREEK FLOWS

SEPTEMBER 1977

EXISTING CONDITIONS (1)

FIGURE 2-4



1 WELCH DITCH
2 CHURCH DITCH
3 CITY OF GOLDEN
4 USGS STREAM GAGE
5 AGRICULTURAL DITCH
6 COORS INDUSTRIAL DITCH
7 COORS COOLING RETURN
8 FARMERS HIGHLINE CANAL
9 COORS COOLING RETURN
10 WANNEMAKER DITCH
11 LEE, STEWART & ESKINS
12 COORS WWTP RETURN
13 CROKE CANAL
14 ROCKY MOUNTAIN DITCH
15 MILES & ESKINS
16 COORS WWTP RETURN
17 RENO & JUCHEM
18 SLOUGH ASSOCIATION
19 SOUTH SIDE
20 OULETTE
21 LENA GULCH
22 CORT, GRAVES & HUGHES
23 WHEAT RIDGE WWTP
24 CLEAR CREEK VAL. WWTP
25 ARVADA WWTP
26 RALSTON CREEK
27 BOYLES
28 KERSHAW DITCH
29 FISHER DITCH
30 LITTLE DRY CREEK
31 WESTERN PAVING
32 CRESTVIEW WWTP
33 COLORADO AG. DITCH
34 CLEAR CREEK & PLATTE RIVER
35 USGS STREAM GAGE
36 SOUTH PLATTE RIVER

NOTE: WWTP'S REFERS TO THE WHEATRIDGE, CLEAR CREEK VALLEY AND ARVADA WASTEWATER TREATMENT PLANTS

CLEAR CREEK FLOWS

AUGUST 1977

FIGURE 2-5

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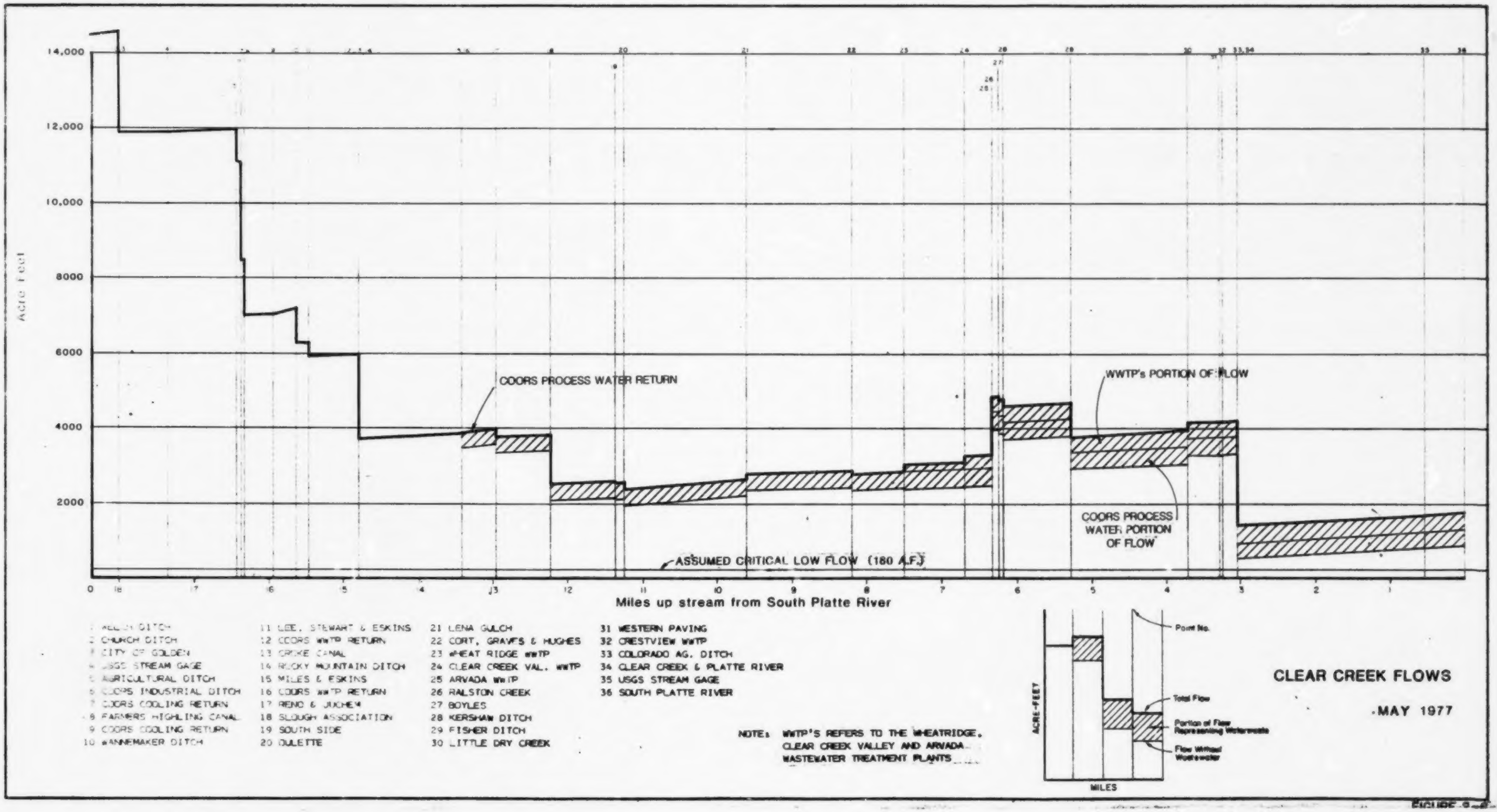


1 WELCH DITCH
2 CHURCH DITCH
3 CITY OF GOLDEN
4 USGS STREAM GAGE
5 AGRICULTURAL DITCH
6 COORS INDUSTRIAL DITCH
7 COORS COOLING RETURN
8 FARMERS HIGHLINE CANAL
9 COORS COOLING RETURN
10 WANNEMAKER DITCH
11 LEE, STEWART & ESKINS
12 COORS WWTP RETURN
13 CROKE CANAL
14 ROCKY MOUNTAIN DITCH
15 MILES & ESKINS
16 COORS WWTP RETURN
17 RENO & JUCHEM
18 SLOUGH ASSOCIATION
19 SOUTH SIDE
20 OULETTE
21 LENA GULCH
22 CORT, GRAVES & HUGHES
23 WHEAT RIDGE WWTP
24 CLEAR CREEK VAL. WWTP
25 ARVADA WWTP
26 RALSTON CREEK
27 BOYLES
28 KERSHAW DITCH
29 FISHER DITCH
30 LITTLE DRY CREEK
31 WESTERN PAVING
32 CRESTVIEW WWTP
33 COLORADO AG. DITCH
34 CLEAR CREEK & PLATTE RIVER
35 USGS STREAM GAGE
36 SOUTH PLATTE RIVER

NOTE: WWTP'S REFERS TO THE WHEATRIDGE, CLEAR CREEK VALLEY AND ARVADA WASTEWATER TREATMENT PLANTS.

CLEAR CREEK FLOWS

MAY 1977

FIGURE 9-

Table No. 2-7
Clear Creek Diversions
Irrigation Year 1977

Structure	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Sum
Welch Ditch	0	0	0	0	0	0	83.2 (194)	477.2 (27.7)	257.4	154.4	0	0	972.2 (221.7)
Church Ditch	0	0	0	0	0	0	2467.1	2991.8	586.1 (51.5)	0 (16.4)	0	0	6045.0 (67.9)
City of Golden	207.9	214.8	214.8	194.0	214.8	207.9	213.8	2059.9 (136.6)	461.5 (1049.4)	296.2 (993.9)	314.8 (712.8)	211.5	2957.9 (2892.7)
Agricultural Ditch	0	0	0	0	0	242.2	839.5	1496.9	1524.6	1342.4	1118.7	435.6	6999.9
Coors Industrial D.	1709.7	1599.8	1294.9	1445.4	1993.9	2188.5	2651.6	3130.4	3779.8	3174.5	2371.3	2006.9	26346.7
Farmers Highline	2544.3	0	0	0	0	1893.9	4296.6	6737.0	3181.9	2746.3	2393.8	2648.9	26478.7
Wannamaker	224	152.5	0	17.8	83.2	799.4	1014.4	823.7	456.0	581.3	556.8	486.3	5195.4
Lee, Stewart & Eskins	99	0	0	30.7	92.1	122.8	352.4	532.6	310.9	178.2	69.3	120.8	1908.8
Croke Canal	1294.9	2864.1	2243.3	1865.2	2183.9	824.7 (26.7)	0	0	0	0	0	0	11276.1 (26.7)
Rocky Mountain D.	0	0	0	0	0	519.4	1861.8	2666.9	1075.9	431.8	305.3	314.4	7175.5
Miles & Eskins	0	0	0	0	0	0	178.2	31.7	0	.8	106.9	48.1	365.7
Reno & Juchem D.	0	0	0	0	0	0	229.7	297.0	130.3	34.7	0	0	691.7
Slough Association	0	0	0	0	0	0	1314.7	1431.5	1142.5	637.6	534.6	508.9	5569.8
South Side	59.4	61.4	61.4	55.4	61.4	59.4	24.8	4.0	0	0	0	0	387.2
Oulette	0	0	0	0	0	0	118.8	219.8	174.2	137.6	118.8	87.1	856.3
Court, Graves & Hughes	0	0	0	0	0	0	71.3	169.3	181.2	160.4	119.8	114.8	816.8
Boyles	0	0	0	0	0	0	38.6	96.0	25.7	0	0	0	160.3
Kershaw Ditch	0	0	0	0	0	0	205.9	485.1	538.6	465.3	615.8	295.0	2605.7

TABLE NO 2-6

CLEAR CREEK

RETURN FLOW

IRRIGATION YEAR 1977

FACILITY	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	SUM
Coors Cooling Water	1700	1600	950	1440	1772	2200	2803	3187	3960	3601	2560	2078	27,851
Coors Augmentation Water			0		128.7		34.9			7.2	239.2	106.2	
Coors/Golden W.W.T.P.	287.0	324.0	370.1	323.1	331.2	323.2	422.0	375.7	325.4	351.0	298.7	297.3	4028.6
Wheatridge W.W.T.P.	207.0	145.7	251.1	212.8	244.9	228.0	238.7	237.0	213.9	173.6	204.0	232.5	2589.2
Clear Creek Val.W.W.T.P.	147.1	152.0	152.0	137.3	152.0	147.1	152	147.1	152	152	147.1	152	1789.7
Arvada W.W.T.P.	76.9	74.4	76.9	69.5	76.9	74.4	76.9	74.4	176.9	76.9	74.4	76.9	905.4
Western Paving	.9	1.9	1.9	1.7	1.9	1.8	1.9	1.8	0	0	0	0	13.8
Crestview W.W.T.P.	45.0	47.0	64.8	47.5	45.2	42.3	PLANT CLOSED						
Totals			1866.8		2752.8		3729.4			4361.7	3523.4	2942.9	

Notes:

1. No data available for Coors Cooling Water returns for the months of November 1976 through April 1977. Values shown for these months are estimates
2. Coors Augmentation Water shown only includes waters that were actually diverted through ditch headgates and then returned to the stream
3. The return flows for the Coors/Golden WWTP was assumed to be transferred directly to the Croke canal from November 15 thru March 31; For the rest of the year the return flow was assumed to return to Clear Creek near the Miles & Eskins Headgate.

Table No. 2-7
(Continued)

Structure	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Sum
Fisher Ditch	386.1	399.0	399.0	360.4	399.0	672.2	956.3	954.4	952.4	645.5	316.8	568.3	7009.4
Colorado Ag. Ditch	0	0	0	0	0	0	712.8	1989.9	427.7	0	0	0	3130.4
Clear Creek & Platte R.	0	0	0	0	0	0	2063.2	2578.0	1366.2	881.1	378.2	778.0	8044.7
Totals	6525.3	5291.6	4213.4	3968.9	5028.3	(26.7) 7530.4	(194) 19694.7	(164.3) 27319.1	(1100.9) 16572.9	(1010.3) 11868.1	(712.8) 9320.9	8660.6	(3209.0) 125994.2

(a) Numbers in ( ) indicate imported water

Table No. 2-8
Clear Creek Gages
Irrigation Year 1977

Stream Gauge	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Sum
Clear Creek Golden Gage	3710	3180	2340	1890	2330	4690	11870	22710	9900	6150	4690	4360	77820
Clear Creek Derby Gage	1300	1270	926	1010	1050	1370	1710	5300	2540	434	138	155	17203

maintained in the future to avoid adverse streamflow impacts on aquatic habitat. However, 3 cfs has not been derived by any technical analyses, but is only an assumed value for discussion purposes.

The Colorado Division of Wildlife has suggested a flow of 15 cfs which will "preserve the natural environment to a reasonable degree." However, Clear Creek has not been a "natural environment" for 120 years, evidenced by the fact that 15 cfs is only exceeded throughout the reach below Golden during the runoff period (Figure 2-6). The Colorado Water Conservation Board has set minimum flow values for several small streams in the Williams Fork River Drainage of from one to five cfs. These are designed to protect trout fisheries from the dewatering effects of water supply diversions and include higher flow values during late summer. Setting of similar standards for a warm water fishery along Clear Creek would provide a goal for continuing efforts in establishing a fishery and preserving overall in-stream values.

The monthly water balances help to define the existing condition in terms of monthly average diversions, return flows, and stream flows. There are two seasons of water use: winter and summer. Most of the diversion ditches take water from about April through October (the summer season), and use it primarily for irrigation. From November through March (the winter season), there are five ditches that divert significant amounts of water for primarily municipal and industrial use: the City of Golden, Coors, Wannamaker, Croke and Fisher.

The two largest winter diverters are Coors and the Croke Canal. Essentially, all of Coors' diversions are returned to Clear Creek by the time it reaches Croke Canal. The Croke Canal then takes effectively all of the flow in Clear Creek, including the Coors process WWTP effluent. Thus, during the winter season, Clear Creek is dry below the Croke. Flows are critically low (less than 3 cfs) until the creek reaches the vicinity of Ralston Creek. At this point, Clear Creek undergoes substantial gains in flow from Ralston Creek and the Wheat Ridge, Clear Creek Valley and Arvada WWTPs. Downstream of this point, the flow remains above the critical level. A portion of the available water is diverted by the Fisher Ditch, but the flow remains above the assumed critical flow.

Flows during the summer season are of two types: runoff months (generally May, June and July) where flow is plentiful, and non-runoff months where the amount of water available is limited. During May of 1977 there are no areas where monthly average flow becomes critically low (less than 180 A-F/mo (3 cfs)).

The situation is quite different in the non-runoff summer months. September is a fairly typical base month for low flows. With reference to Table 2-5 and Figure 2-4, there are three locations of critical flow. The first reach with critical flows is below the Slough Association Ditch headgate and extends to the Wheat Ridge WWTP. With the contributions of the three WWTPs and Ralston Creek, the flow in Clear Creek rises well above the critical low flow. However, the Kershaw Ditch (just downstream of Ralston Creek) diverts over half of the Clear Creek flow. About 1 mile further downstream the Fisher Ditch diverts enough water to bring the remaining flow in Clear Creek to a critical low flow (less than 180 A-F/mo). Natural gains increase the flow to above critical flow until the Clear Creek and Platte River Ditch is reached. This ditch diverts all flow in the stream leaving the flow below the headgate at essentially zero. Although Clear Creek accrues some gains in the flow below the Fisher Ditch, the flow remains at a critical level as it continues downstream to the South Platte River.

The methodology used for the water balances is a summation of inflows and outflows. The flow at the Derby gage plus the sum of the diversions minus the WWTP inflows usually gives a value higher than the flow at the Golden gage. Thus, the river experiences a net gain. The gains have been apportioned to major side drainage inflow points and to creek reaches on a per-mile basis, drawing on discussions with Dale Anderson and Coors combined with the known diversions. The apportioning is only approximate; no data is available that accurately defines tributary and other miscellaneous inflows to the river. This is true for the flows contributed to Clear Creek from Lena Gulch, Ralston Creek and Little Dry Creek which are important sources of water for the ditches on the lower portion of Clear Creek. For the low flow months, reasonable estimates can be made for these flows based on diversions downstream of these major drainage flows.

The same type of water balance analysis was not performed for 1975. The lack of accurate data on Coors' flows would induce enough error in the calculations to render them meaningless. However, the flow information that is available provides a comparison between dry year and average year diversions. Therefore, the data available for 1975 diversions and gage flows is presented in Tables 2-9 and 2-10. For almost all ditches, the 1975 diversion amounts were much higher than in 1977, indicating that if more water is available, it would be used, and the stream conditions probably would not differ substantially from what has been presented for a dry year.

Due to an absence of accurate historical records, a similar analysis for conditions that existed from 1960 to 1967 (pre-interceptor) isn't possible. However, the MDSDD Predesign Report (1961) contained the same type of analysis for 1954 and 1959. That analysis contained some significant differences from this one. The MDSDD report apportioned net gains or losses per river mile with no consideration of major side drainage inflow. Coors' operations appear to have been neglected. In 1954, there were eight WWTP's discharging into Clear Creek. Combined, they discharged about 3,560 A-F of treated effluent into Clear Creek. In 1977, the sum of the discharges of the Wheat Ridge, Clear Creek Valley and Arvada WWTP's amounted to 5,285 A-F.

In general, with the above differences taken into account, the Predesign Report showed very similar flow regimes. That is, critical flows occurred at the Croke Canal during the winter season, and below the

TABLE 2-9

CLEAR CREEK DIVERSIONS

IRRIGATION YEAR 1975

STRUCTURE	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	SUMS
Welch Ditch	0	0	0	0	0	0	162	622	923	691	309	63	2,770
Church Ditch	0	0	0	0	0	1267	1857	4491	5001	2447	0	0	15,063
City of Golden	208	215	131	139	154	168	184	204	216	216	208	216	2,259
Agricultural Ditch	0	0	0	0	0	83	1204	1374	2053	1792	1725	869	9,100
Coors Industrial D.	-	-	-	-	-	-	-	-	-	-	-	-	-
Farmers Highline	600	0	0	0	0	1275	5625	8183	12676	4948	2612	2683	38,602
Wannamaker D.	224	152	202	174	293	493	853	1251	738	618	431	422	5,851
Lee, Stewart & Eskins	168	151	165	159	184	52	386	1087	1083	612	158	137	4,342
Croke Canal	2980	2973	2809	2686	3222	933	341	8255	0	0	0	0	24,199
Rocky Mountain D.	95	0	0	0	0	143	568	946	1766	1536	240	253	5,547
Miles & Eskins	214	198	194	166	198	255	220	214	222	222	214	222	2,539
Reno & Juchem D.	0	0	0	0	0	0	275	255	311	457	22	22	1,342
Slough Association	0	0	0	0	0	0	986	1249	1655	1725	796	701	7,112
South Side	137	196	192	119	95	129	152	218	224	224	216	224	2,126
Oulette	0	0	0	0	0	0	73	71	73	73	71	71	432
Court, Graves & Hughes	0	0	0	0	0	0	137	178	178	154	149	149	945
Boyles	0	0	0	0	0	0	59	89	85	61	30	0	324
Kershaw Ditch	0	0	0	0	0	0	251	677	699	699	677	699	3,702
Fisher Ditch	297	584	497	471	244	881	1329	1576	1600	1378	1622	950	11,429
Colorado Ag. Ditch	0	0	0	0	0	0	645	1182	1608	1139	539	103	5,216
Clear Crk. & Platte R.	0	0	0	0	0	51	1447	1420	2180	1980	1970	994	10,042
Totals	4923	4469	4190	3914	4390	5730	16754	33542	33291	20970	11989	8779	152,942

NOTE: No data available for Coors Industrial Ditch in 1975

TABLE 2-10

CLEAR CREEK GAGES

IRRIGATION YEAR 1975

STREAM GAGE	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	SUMS
Clear Creek Golden Gage	4040	2910	2800	2640	2990	2730	10750	43460	44430	11960	7510	4860	141,080
Clear Creek Derby Gage	1650	1030	1180	930	1150	1400	2750	23090	25030	2310	879	685	62,084

Slough Association, Fisher and the Clear Creek and Platte River ditches during the summer season. The Predesign Report concluded that if all WWTP's on Clear Creek entered MDSDD and used the proposed 1967 interceptor, then the water rights of the Fisher, Clear Creek and Platte River and the Colorado Agricultural Ditch would be injured.

However, not all wastewater flows are being sent to the MDSDD interceptor, and it appears that the above-mentioned ditches are not being injured. Table 2-11 presents annual flow and diversion data for the USGS gages and the three most downstream diversion ditches for three average years and two dry years. Comparison of dry year 1977 versus dry year 1954 shows that the annual amounts of water diverted in 1977 are very similar to the 1954 amounts. The same situation holds true for a comparison of 1958 and 1956 versus 1975 (all three are near average). It appears that the 1967 interceptor has not decreased the flows available to the lower Clear Creek ditches. The Leonard Rice report (1978) presented a trend analysis of the lower Clear Creek ditches that indicated decreasing trends in flow. However, the trend analysis was followed by a disclaimer that stated: "Changes in diversion rates are not an accurate indicator of the water rights impacts of Metro facilities and no definite conclusions can be drawn from their analysis."

2.4 WATER QUALITY

2.4.1 General Considerations

Water quality in Clear Creek from Golden to the South Platte River is linked closely with several auxiliary issues such as WWTP discharges, stream diversions, upstream pollutant discharges, and land use. The existing water quality conditions are best described in relation to these continually changing other factors.

In general, water quality in Clear Creek is or has been adversely affected by abandoned mine drainage upstream of Golden, sewage treatment plant discharges and urban runoff. Due to the periodic near-total diversion of the stream flow, irrigation return flows, groundwater

TABLE 2-11

Annual Flows, Pre-and Post 1967
All values in Acre-Feet

Year	USGS Gage Golden	USGS Gage Derby	Fisher	Colorado Agricultural	Clear Creek & Platte Valley
Dry Years	75,520	15,550			
1977 [1]	77,820	17,203	7009	3130	8044
1954 [2]	68,200	10,934	7632	2400	7201
Average Years	140,300	61,960			
1975 [1]	141,080	62,084	11,429	5216	10,042
1958 [2]	147,960	88,580	6632	3428	8700
1956 [2]	138,030	56,347	7715	6168	9956

[1] Irrigation Year

[2] Calendar Year (from the MDSDD Predesign Report)

seepage and point source discharges are significant contributors to total flow in several stream segments. Thus the impact of the pollution characteristics of these sources on in-stream water quality can be critical.

2.4.2 Water Uses and Discharges

Wastewater Treatment Plants

Previous sections have discussed water diversions and discharges from sewage treatment plants on Clear Creek. Of particular importance to the water quality issue is the depletion of stream flow caused by diversions and subsequently the increased impacts of the treatment plant discharges. Specific impacts and water quality data are presented in later sections.

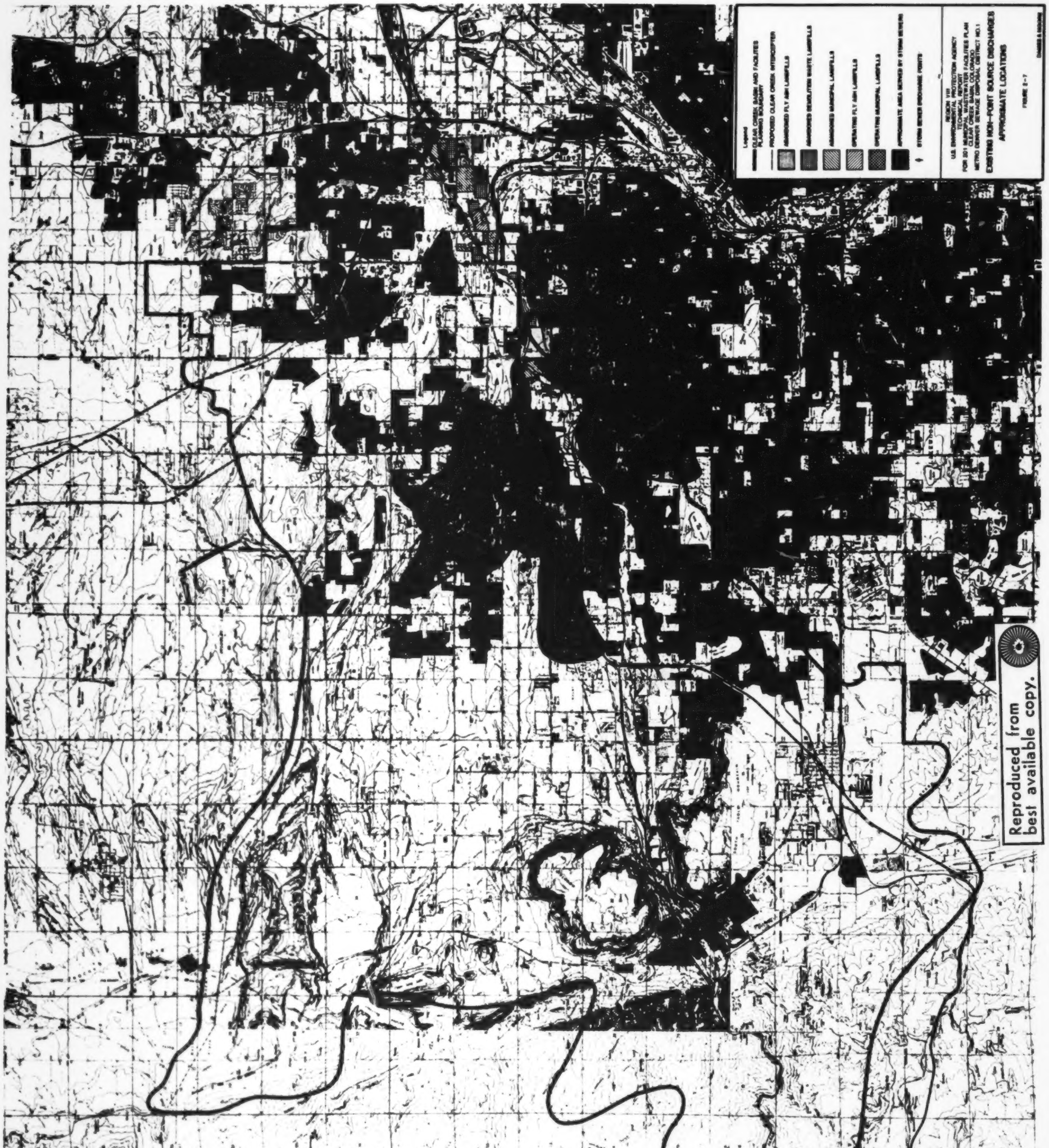
Urban Runoff

Another discharge to Clear Creek consists of runoff from storm events and snowmelt. As discussed in earlier reports, pollution loadings from storm runoff can be quite high and is related strongly to land use. Urban runoff loadings are usually applied the length of the stream, however the presence of storm sewers or surface drainage systems converts these non-point sources to point sources.

In the Clear Creek basin, a significant portion of the urban area is served by storm sewers, and the remainder is served by ditch or gutter systems. Figure 2-7 shows the approximate areas served by storm sewers and approximate discharge points. Much of the urban runoff not discharged directly to Clear Creek is collected in Ralston Creek, Little Dry Creek and Lena Gulch. Thus a significant portion of the non-point pollutant loading from urban runoff is concentrated in the reach between Kipling and Sheridan Streets.

Irrigation Return Flow and Groundwater

Another issue is the effect of ground water and irrigation return flow to Clear Creek. Irrigation return flow may enter the stream through


Legend
CLEAR CREEK BASIN AND FACILITIES PLANNING BOUNDARY
PROPOSED CLEAR CREEK INTERCEPTOR
ABANDONED FLY ASH LANDFILLS
ABANDONED DEMOLITION WASTE LANDFILLS
ABANDONED MUNICIPAL LANDFILLS
OPERATING FLY ASH LANDFILLS
OPERATING MUNICIPAL LANDFILLS
APPROXIMATE AREA SERVED BY STORM SEWERS
STORM SEWER DISCHARGE POINTS
REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL REPORT
FOR 201 MUNICIPAL WASTEWATER FACILITIES PLAN
CLEAR CREEK BASIN, COLORADO
METRO DENVER SEWAGE DISPOSAL DISTRICT NO.1
EXISTING NON-POINT SOURCE DISCHARGES
APPROXIMATE LOCATIONS
FIGURE 2-7
DAMES & MOORE

Reproduced from best available copy.

ground water discharge or direct return by ditches and feeder streams. This flow contributes nitrogen, phosphorus, dissolved solids and chemical pesticides and fertilizers. Ground water flow pollutants are contributed via infiltration of runoff water and by leaching of pollutants from subsurface sources, such as landfills.

It is expected that the majority of the irrigation return flow is discharged to Clear Creek in the upper half of the segment studied or by way of Ralston Creek, Little Dry Creek or other small tributaries. Irrigation flow contributions to ground water will occur from leaky ditches and at irrigated sites. The locations of irrigated fields and irrigation ditches are discussed and shown in other sections.

Potential subsurface sources of pollution in the basin include septic tanks, sewer lines and existing and abandoned landfills. Figure 2-7 shows the approximate locations of known abandoned and operating landfills. Present regulations signficantly reduce the ground water pollution hazards from the operating landfills, however the pollution contribution from the numerous abandoned landfills is difficult to evaluate. Municipal landfills can contribute a wide range of parameters including iron, manganese, calcium, nitrogen and organics. Due to the relatively slow processes involved, landfill generated pollutants are released over periods of years and possibly decades, depending upon the types of materials deposited, methods of placement, quantities involved, depth and size of landfills and ground water conditions. The concentration of landfills adjacent to Clear Creek between Sheridan and Broadway Boulevards, presents a high pollution potential.

Mine Drainage

Obviously, the upstream water quality conditions provide a base to which downstream contributions are added. Upstream of Golden the primary impact on water quality is drainage from abandoned mines. Two particular areas contribute the most significant loading of metals and reduced pH:

the Argo Tunnel at Idaho Springs and the North Fork of Clear Creek flowing from the mining district around Central City (Holm, 1980).

These and other mine drainage sources in the basin have deteriorated the upper Clear Creek water quality to the point where fish and other aquatic species cannot survive. However the effects of this drainage are markedly reduced by the time Clear Creek enters the study area at Golden. Flow diversions and dilution further reduce these values through the study area.

2.4.3 Water Quality Data

Water quality in this segment of Clear Creek has been measured more or less continuously since 1967 at the USGS stream gages above Golden and near the mouth at Derby (York Street Bridge). Data has also been collected at other stations shown in Figure 2-1. This data is available from the STORET file, and has been presented in numerous previous reports.

Generally, the data shows that significant parameters, in terms of standards, and environmental and public health effects, are fecal coliform, various metals, ammonia, phosphorus and chlorine. Tables 2-12 through 2-18 present summaries of the STORET data for these parameters for selected months since 1976.

The general trends evidenced by these data support earlier analyses. Phosphorus increases downstream from Golden, probably due to sewage treatment plant discharges and urban runoff. Ammonia follows the same pattern, however a more marked increase is noted in the lower portion than in the upper. Fecal coliforms increase downstream from Golden with the largest increase in the segment above Kipling.

Figures 2-1 and 2-7 show the locations of sewage treatment plant discharges and urban runoff returns via storm sewers or major drainage

Table 2-12

Water Quality Data

Selected Averages

Fecal Coliform

(per 100ml)

Date	Above Golden	Youngfield	Kipling St.	York St.
5/76 - 7/76	(13) 614	--	(77) 1617	(586) 583 (1180)
9/76 - 10/76	(23) 18	--	(1500) 483	(2300) 430 (1082)
11/76 - 3/77	(56) 824	260	(288) 140	(787) 9,007 (5153)
5/77 - 7/77	2440	--	8980	11,012 (2455)
9/77 - 10/77	45	--	320	973
11/77 - 3/78	838	--	4648	4060
5/78 - 7/78	93	--	564	1648
9/78 - 10/78	410	--	396	270
11/78 - 3/79	4071	--	71	1170
5/79 - 7/79	75	--	-	430
9/79 - 10/79	93	--	-	330

( ) Indicates special studies data

Table 2-13

Water Quality Data
Selected Averages
Ammonia (Total)
(mg/l)

Date	Above Golden	Youngfield	Kipling St.	York St.
5/76 - 7/76	(.13) .16	--	(.147) .163	(.44) 1.90 (.67)
9/76 - 10/76	(.31) .03	--	(.32) .233	(.24) 1.03 (1.20)
11/76 - 3/77	(.00) .38	.00	(.473) .542	(6.49) 4.81 (6.24)
5/77 - 7/77	.19	--	1.2	.825
9/77 - 10/77	.20	--	.45	1.3
11/77 - 3/78	.42	--	.49	6.55 (3.83)
5/78 - 7/78	.08	--	.27	.505
9/78 - 10/78	.15	--	.203	.52
11/78 - 3/79	.39	--	.284	4.56
5/79 - 7/79	.15	--	.23	-
9/79 - 10/79	.05	--	.056	.06

( ) Indicates special studies data

Table 2-14

Water Quality Data

Selected Averages

Phosphorus -(Total)

(mg/l)

Date	Above Golden	Youngfield	Kipling St.	York St.
5/76 - 7/76	(.00) .03	--	(.08) .193	(.32) .568
9/76 - 10/76	(.00) .01	--	(.12) .186	(.22) .64
11/76 - 3/77	(.02) --	.13	(.24) .226	(1.41) 1.79
5/77 - 7/77	--	--	--	--
9/77 - 10/77	--	--	--	--
11/77 - 3/78	--	--	--	--
5/78 - 7/78	.03	--	.103	.26
9/78 - 10/78	.02	--	.558	.33
11/78 - 3/79	.09	--	.507	1.12
5/79 - 7/79	.13	--	.145	.43
9/79 - 10/79	.05	--	.49	.28

( ) Indicates special studies data

Table 2-15

Water Quality Data

Selected Averages

Iron (Total)

(μg/l)

Date	Above Golden		Kipling St.		York St.		
5/76 - 7/76	(740)	1000	(875)	650		350	(1238)
9/76 - 10/76	(1297)	720	(887)	1100	(460)	430	(743)
11/76 - 3/77	(2200)	1290	(720)	823	(41)	937	(715)
5/77 - 7/77		780		650	(1958)	725	
9/77 - 10/77		840		0		570	
11/77 - 3/78		1330		375		1200	
5/78 - 7/78		1100		1842		894	
9/78 - 10/78		575		433		607	
11/78 - 3/79		585		513		1147	
5/79 - 7/79		1200		900		1500	
9/79 - 10/79		977		330		567	

( ) Indicates special studies data

Table 2-16

Water Quality Data

Selected Averages

Zinc (Total)

(μg/1)

Date	Above Golden	Kipling St.	York St.
5/76 - 7/76	(220) 400	(185) 300	50 (113)
9/76 - 10/76	(333) —	(117) 180	(99) 41 (25)
11/76 - 3/77	(775) 590	(155) 133	(64) 110 (25)
5/77 - 7/77	325	200	(138) 40
9/77 - 10/77	200	80	60
11/77 - 3/78	635	135	90
5/78 - 7/78	330	293	183
9/78 - 10/78	278	390	40
11/78 - 3/79	479	94	49
5/79 - 7/79	303	120	165
9/79 - 10/79	343	70	23

( )Indicates special studies data

Table 2-17

Water Quality Data

Selected Averages

Copper (Total)

(μg/1)

Date	Above Golden	Kipling St.	York St.
5/76 - 7/76	(23) 0	(26) 0	0 (17)
9/76 - 10/76	(44) 42	(21) 34	(25) 8 (16)
11/76 - 3/77	(77) 38	(7) 16	(36) 18 (15)
5/77 - 7/77	16	27	(58) 17
9/77 - 10/77	0	0	0
11/77 - 3/78	45	26	3
5/78 - 7/78	37	37	24
9/78 - 10/78	29	12	7
11/78 - 3/79	45	11	15
5/79 - 7/79	50	28	31
9/79 - 10/79	46	11	11

( ) Indicates special studies data

Table 2-18

Water Quality Data

Selected Averages

Manganese(μg/l)

Date	Above Golden	Kipling St.	York St.
5/76 - 7/76	(157) 690	(248) 250	350 (273)
9/76 - 10/76	(60) —	(227) 310	(250) 170 (263)
11/76 - 3/77	(1050) 1037	(250) 243	497 (400)
5/77 - 7/77	320	60	(538) 185
9/77 - 10/77	470	0	2100
11/77 - 3/78	720	85	840
5/78 - 7/78	--	530	330
9/78 - 10/78	510	168	223
11/78 - 3/79	650	246	615
5/79 - 7/79	563	235	345
9/79 - 10/79	763	90	333

( ) Indicates special studies data

channels. Urban runoff is concentrated in the reach of Clear Creek from Kipling Street through Sheridan Boulevard, as are sewage treatment plant discharges. This probably accounts for the significant phosphorus and ammonia increases.

Critical low flow reaches of the stream have been identified in Section 2.3. In these reaches, the influence of various discharges on in-stream water quality is increased. Increases in ammonia, fecal coliform, and phosphous concentrations in Clear Creek from the wastewater discharges will become more pronounced during low flow conditions. Sewage was estimated to comprise 70 percent of the flow in Clear Creek between Wadsworth Boulevard and Ralston Creek during low flow periods of January and September, 1977.

The metals analysed show a general decrease downstream from Golden. Copper and zinc decrease throughout the segments under study, but iron and manganese increase in the lower segment of the stream. Iron and manganese are associated with landfill leachate and the concentration of abandoned landfills in this lower segment of the stream may account for these increases.

2.4.4 Water Quality Standards

Current state classification of water quality in Clear Creek is established to provide for secondary contact recreation, domestic water supply and fisheries: cold-water above Golden and warm-water below. Table 2-19 lists some of the parameters established by the Colorado Department of Health to meet this classification.

TABLE 2-19

EXISTING WATER QUALITY STANDARDS
CLEAR CREEK

Parameter	B1 Above Golden	B2 Below Golden
Fecal Coliform (30 day avg.)	1000/100ml	1000/100ml
Dissolved Oxygen	6mg/1	5mg/1
Temperature	maximum 68°F maximum change 2°F	maximum 90°F maximum change 5°F
pH.	6-9	6-9
Turbidity	no increase greater than 10 JTU	no increase greater than 10 JTU

2.5 FISHERIES - AQUATIC HABITAT

2.5.1 Present Aquatic Inhabitants

Five post-1967 fish collections were conducted on Clear Creek from Golden to the South Platte River. All collections were obtained during a four-year period (1976-1980). These recent investigations of Clear Creek have been pursued in response to the potentially altered utilization of the stream, while earlier investigations were focused on reservoirs and gravel excavation pits adjacent to Clear Creek and associated with the Wheat Ridge Greenbelt between Youngfield Street and Wadsworth Boulevard. The dates of collection and personnel conducting the post-1967 surveys on Clear Creek are as follows: 13 December 1976 (Woodling, Colorado Department of Health), 29 August 1979 (Whittaker, Colorado Division of Wildlife), 18 April 1980 (Mars, Colorado Department of Health), 8 May 1980 and 9 July 1980 (NUS for Adolph Coors Company). Results of the collections are presented in Table 2-20 adapted from NUS (1980). Based on the lack of systematic sampling and inconsistent levels of identification, this data should only be used for the qualitative assessment of the fish inhabitants in Clear Creek between Golden and the South Platte River.

Habitat preferences of the inhabiting aquatic organisms generally reflect the habitat characteristics of the stream. However, since some individual fish and aquatic macroinvertebrates, in particular, were identified only to genus, characterization of each collection site based on the food or habitat preferences of the aquatic organism inhabiting that particular section of stream is unjustified, because within each genus different species will prefer different habitats. Therefore, considering the preferred habitat of the aquatic organisms, Clear Creek can only be generally characterized.

The White Sucker (_Catostomus commersoni_), specifically, is found throughout Clear Creek from the Croke Canal diversion to York Street. This Catostomid tends to avoid rapid currents and feeds on a variety of animal food but predominately on insects. The stomach contents of an individual are as much determined by the availability of a certain food

TABLE NO. 2-20
RESULTS OF FISHERY SURVEYS IN CLEAR CREEK BETWEEN GOLDEN AND SOUTH PLATTE RIVER
(All large numbers are estimates)

		Croke Canal	Youngfield Street			Prospect Park	Kipling Street	Johnson Park	Harlan Street	Sheridan Boulevard		Pecos Street	Broadway		York Street		
		A	B	C	D	E	D	E	D	E	D	D	E	D	C	E	D
White Sucker	Catostomus commersoni suckleyi	-	1	-	5	6	-	6	-	6	1	3	-	-	-	-	5
Longnose Sucker	Catostomus griseus	96	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suckers		-	-	-	250	-	150	-	-	-	-	-	-	-	-	-	-
Longnose Dace	Rhinichthys Cataractae	-	1	-	-	3	-	1	-	1	-	-	-	-	-	-	-
Creek Chub	Semotilus Atromaculatus	-	-	-	3	8	3	-	-	-	-	-	-	-	-	-	-
Fathead Minnow	Pimephales Promelas	-	5	1	-	3	-	3	-	6	-	-	-	-	4	-	-
Sand Shiner	Notropis deliciosus missuriensis	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carp	Cyprinus Carpio	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-
Minnows /Shiners		-	-	-	200	-	-	-	-	-	-	100	-	200	2	-	-
Brown Bullhead	Ameiurus nebulosus	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Green Sunfish	Lepomis cyanellus	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Sunfish	Lepomis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Largemouth Bass	Micropterus salmoides	-	-	-	15	1	-	4	-	-	-	-	-	-	-	3	-

A=May 8, 1980 (Coors) B=April 18, 1980 (Mars) C=July 9, 1980 (Coors) D=December 13, 1976 (Woodling)

E=August 29, 1979 (Whittaker)

Adapted from NUS (1980).

as by its food preference (Baxter and Simon, 1970). The Longnose Sucker (Catostomus catostomus) was collected only at the Croke Canal diversion and Youngfield Street. The Longnose Sucker feeds predominately on insect larvae, plant material, and small molluscs, and prefers much the same habitat as the White Sucker. The remaining Sucker collections are comprised of unspecified Catostomids, possibly being a combination of the two previously mentioned species.

Several species of the family Cyprinidae (minnows) were collected throughout the lower segment of Clear Creek. These species include the Longnose Dace (Rhinichthyes cataractae), the Creek Chub (Semotilus atromaculatus), the Fathead Minnow (Pimephales promelas), the Sand Shiner (Notropis deliciosus), and the Carp (Cyprinus carpio). The Cyprinids consist of a group of fish whose individual species members are adapted to various habitats and maintain certain feeding preferences. The Longnose Dace can be found in riffles of both large and small streams and are typically omnivorous, feeding on aquatic insects and algae. The Creek Chub prefers fairly clear water with gravel bottoms for spawning and is largely carnivorous preferring insects, crustaceans, and small fish. The Fathead Minnow was generally found from Youngfield Street to York Street. This minnow tolerates turbid water quite well and is usually found in this type of habitat. The Fathead Minnow is mainly herbivorous but may feed on small aquatic insect larvae and can be very prolific given proper spawning habitat including submerged objects which are suspended for the attachment of eggs on the underside. The Sand Shiner is usually found in very shallow water in permanent sandy streams. Little is known about its feeding habits, but it is generally considered omnivorous. The Carp usually feed by "rooting" in the mud for bottom dwelling aquatic insects. This Cyprinid occurs typically in lakes, reservoirs, and large rivers but occasionally will be found in small streams in pools and quiet waters.

The remaining groups of fish collected from Clear Creek include the Brown Bullhead (Ameiurus nebulosus), the Green Sunfish (Lepomis cyanellus), and the Largemouth Bass (Micropterus salmoides). The Brown

Bullhead is usually found in rivers and streams having muddy bottoms which is adequate for nest buiding. The Brown Bullhead feeds primarily on insect larvae, crustaceans, and molluscs. The Green Sunfish prefers the pools in small- to medium-sized streams and feeds on insects and small fish. The Largemouth Bass is generally found in the backwaters of slow streams whose summer water temperatures exceed 75°F. The Largemouth Bass is carnivorous, feeding predominately on smaller forage fish.

Fishing pressure on Clear Creek between Golden and the South Platte River is virtually nonexistent (Woodling, 1980). A majority of the angling effort is directed toward the more productive inundated gravel pits adjacent to Clear Creek.

Because benthic macroinvertebrate collections were initially recorded as relative abundance for some samplings, tabulations for the purposes of this report are not quantified. The qualitative results of the benthic macroinvertebrate samplings conducted by Woodling (in preparation) on 13 September 1976 and by NUS (1980) on 8 May 1980 and 9 July 1980 are presented in Table 2-21. The relative abundance of each taxon is represented as follows: P = present (1-5 individuals), C = common (6-50 individuals), A = abundant (over 50 individuals). Table 2-21 was adapted from NUS (1980).

2.5.2 Potential Aquatic Inhabitants

A literature review has revealed little information concerning fish collections on Clear Creek near Denver and prior to 1967. The only documented collection found was that of a Silvery Minnow (*Hybognathus nuchalis*) collected by W.C. Ferril on 7 August 1900 in Clear Creek near Denver. The Silvery Minnow is usually found in the plains streams of eastern Colorado (Ellis, 1914).

In the early 1900s, several fishery surveys were conducted on streams to the north and south of Clear Creek. Table 2-22 presents the

TABLE NO. 2-21
Relative Abundance of Macro-invertebrates
Collected from Clear Creek Below Golden

	Croke Canal B (5-8-80)	McIntyre Street A (9-13-80)	Youngfield Street B (7-9-80)	Kipling Street A (9-13-76)	Wadsworth Boulevard A (9-13-76)	Pecos Street A (9-13-76)	York Street A (9-13-76)	York Street B (7-9-80)
Trichoptera (Caddisflies)								
Rhyacophilidae								
Rhyacophila	P	-	-	-	-	-	-	-
Hydropsychidae								
Hydropsyche	-	P	P	A	C	-	-	-
Brachycentridae								
Brachycentrus americanus	-	-	P	-	-	-	-	-
Hydroptilidae	-	-	-	-	-	-	C	-
Plecoptera (Stoneflies)								
Pteronarcidae								
Pteronarcella	-	-	P	C	P	-	-	-
Chloroperlidae	-	-	P	-	-	-	-	-
Perlidae								
Hesperoperla pacifica	-	-	P	-	-	-	-	-
Ephemeroptera (Mayflies)								
Baetidae								
Baetis	C	C	C	A	A	C	A	C
Ephemerella	-	-	-	-	C	C	-	-
Tricorythodes	-	-	-	-	-	-	A	-
Odonata (Dragonflies)								
Gomphidae								
Ophiogomphus	-	P	P	C	C	-	-	-
Coenagrionidae	-	-	-	P	-	-	-	-
Diptera (True flies)								
Chironomidae	P	P	-	P	P	C	P	-
Ceratopogonidae	-	-	P	-	-	-	-	-
Rhagionidae								
Atherix pachypus	-	-	P	-	-	-	-	-
Simuliidae	-	-	-	-	-	-	P	-
Orthocladinae	-	-	-	-	-	-	-	P
Physa (Snails)	-	-	-	C	P	P	A	-
Hirudinae (Leeches)	-	-	-	-	-	P	C	-
Nematoda (Roundworms)	-	-	-	P	-	P	-	-
Amphipoda (Crustaceans)	-	-	-	-	-	P	C	-

A - Woodling (Colorado Department of Health, in preparation)

B - NUS (1980)

P - present (1-5)

C - common (6-50)

A - abundant (more than 50)

TABLE NO. 2-22

Fish Species Collected From
Streams Near
Clear Creek in the Early
1900s - from Ellis (1914)

Common Name(s)	Scientific Name	Boulder Creek near Boulder (1)	Boulder Creek 6mi. east of Boulder (2)	West Plum Creek near Castle Rock (3)	St. Vrain Creek near Longmont (4)
Suckley's Sucker	Catostomus commersoni sucklii	X	X	X	
Gray Sucker Platte River Sucker Fine-scaled Sucker	Catostomus griseus	X	X	X	X
Goldfish	Carassius auratus				X
Stone-roller Greased Chub	Campostoma anomalum	X	X	X	
Western Red-Bellied Dace	Chrosomus erythrogaster dakotensis	X	X	X	X
Black-headed Minnow Fat-head	Pimephales promelas		X	X	X
Silvery Minnow	Hybognathus nuchalis	X	X		X
Sucker-mouthed Minnow	Phenacobius mirabilis		X		X
Cayuga Shiner	Notropis cayuga	X			
Platte River Shiner	Notropis piptolepis	X	X	X	
Western Shiner	Notropis scylla	X			X
Common Shiner	Notropis cornatus	X	X	X	X
Redfin	Notropis lutrensis				X
Creek Chub Horned Dace	Semotilus atromaculatus	X	X	X	X
Mountain Dace	Couesius dissimilis	X			X
Horny-head Indian Chub Jerker	Hybopsis kentuckiensis				X
Dulcis Minnow Western Long-nosed Dace	Rhinicthys cataractae dulcis	X	X	X	
Zebra Fish Zebra Top-minnow	Fundulus zebrinus	X	X		X
Little Red Fin Little Green Top-minnow	Fundulus floripinnis	X	X		X
Green Sunfish Blue-Spotted Sunfish	Lepomis cyanellus				X
Iowa Darter	Etheostoma iowa			X	X
Johnny Darter	Boleosoma nigrum mesaeum	X	X	X	X

(1) C. Juday and J. Henderson; October, 1903

(2) M.M. Ellis; 25 July, 1912

(3) A.G. Vestal and M.M. Ellis; 9 June, 1912

(4) C. Juday and D.W. Spangler; 17 October, 1903

findings of four surveys directed by C. Juday and J. Henderson in 1903 on Boulder Creek near Boulder, by M.M. Ellis in 1912 on Boulder Creek six miles east of Boulder, by A.G. Vestal and M.M. Ellis in 1912 on West Plum Creek near Castle Rock, and by C. Juday and C.W. Spangler in 1903 on St. Vrain Creek near Longmont. Because of their proximity to Clear Creek, these particular surveys were selected to determine those fish species which possibly inhabited Clear Creek at the turn of the century and do not inhabit it now. This is not to be interpreted as being definite proof that these particular species also inhabited Clear Creek in the early 1900s. However, based on the lack of data on the subject stream, one can only extrapolate the probability of these particular fish species occurring in Clear Creek. A brief comparison of Tables 2-20 and 2-22 indicates a higher species diversity occurred around 1900 than does now. It should be noted that 15 of the 22 species in Table 2-22 (Goldfish to Longnose Dace) are Cyprinids (minnows) and species of this group have been generalized in Table 2-20. The only species which occurred in any of the four early 1900 surveys and not in the present surveys of Clear Creek include the Zebra Topminnow (Fundulus zebrinus), the Little Green Topminnow (Fundulus floripinnis), the Iowa Darter (Etheostoma iowae), and the Johnny Darter (Boleosoma nigrum mesaeum). The Zebra Topminnow is a species of the shallow streams of the plains, coming up to but not entering the true foothill streams (Ellis, 1914). The Little Green Topminnow, as described by Ellis (1914), is found in the western portion of the South Platte drainage. The Iowa Darter prefers cold rapid streams and is found throughout the northwest portion of the Mississippi River drainage. The preferred habitat of the Johnny Darter includes small spring-fed streams of steep gradient with rock or gravel substrate (Cross, 1967). Based on the above findings, there exists the possibility that the darters did inhabit Clear Creek during a time when stream flows were more favorable. However, considering present stream flow variations and restrictions, prime habitat for the Iowa and Johnny Darter is wanting in Clear Creek between Golden and the South Platte River.

An additional ongoing study has been recently implemented by the Colorado Division of Wildlife. This involves the initial planting of

1,300 six-inch Channel Catfish (Ictalurus punctatus) on 1 August 1980 in Clear Creek from Youngfield Street downstream through Wheat Ridge (Woodling, 1980). The Colorado Division of Wildlife will be monitoring this plant in the future to determine the extent of adaptability of the Channel Catfish to this segment of Clear Creek.

2.5.3 Physical Stream Characteristics

For the purpose of aquatic habitat assessment, Clear Creek from Golden downstream to the South Platte River will be divided into three segments each of which has its own general characteristics. This will include the following segments: (1) Golden to Youngfield Street, (2) Youngfield Street to the Wheat Ridge Wastewater Treatment Plant (WWTP), and (3) Wheat Ridge WWTP to the confluence of the South Platte River. In most sections, the existing quality of stream habitat has been limited due to an excess or a lack of various habitat-related parameters characteristic to each segment.

Late summer stream flows, August through October, represented in Table 2-5 (September, 1977) were chosen for assessing the present adequacy of the stream for supporting a fishery. These flows are most critical due to the subsidence of spring runoff and increased agricultural utilization of the water remaining in the stream. The lack of substantial instream flow can result in the stagnation of pools, should they be present, causing severe oxygen depletions through lack of oxygen transfer, organic decay and eutrophication (algal activity), and the raising of water temperatures beyond the tolerance of most fish species.

Between Golden and Youngfield Street, stream flows fluctuate frequently in response to water demands from agriculture and surrounding municipalities. Table 2-5 indicates flows are generally adequate during September to support a fishery from Golden to the Slough Association ditch or Youngfield Street (4.2 miles). However, during January (Table 2-4) because of the rerouting of Coors WWTP effluent to the Croke Canal, flows become critically low from the Croke Canal diversion to Youngfield Street. Excessive channelization of this section of stream appears to be limiting the perpetuation of a fishery. There is limited submerged aquatic vegetation and, due to fluctuating flow, most riparian vegetation is located far from the stream's edge (Plate 1). The water quality in this section is generally acceptable except for high concentrations of residual chlorine which have been detected by Woodling (in preparation) below the Coors process WWTP. For nine samples taken from Coors' effluent on 13 December 1976, total residual chlorine averaged 0.7 mg/l including three determinations of 0.0 mg/l. These high concentrations of residual chlorine were, according to Woodling, attributable to two separate causes. Coors' analytical methods were drastically underestimating the residual chlorine concentrations. Since that time, Coors' laboratory has acquired an amperometric titration device which has allowed the readjustment of the chlorine feed. The second cause lies in the properties of the wastewater being treated. At the time the water samples were obtained, Coors was treating both domestic and process water. Some of the process water is the end result of a barley wash operation which possibly introduces excessive bacteria counts to the water. A high chlorine feed is thus needed to eliminate the bacteria. These data are supported by the 1979 average chlorine concentration of 0.5 mg/l (Table 2-1). Residual chlorine does have a tendency to dissipate very rapidly and, as a result, prohibits a fishery only immediately below the effluent.

The major factors limiting a fishery in this section of stream appear to be the fluctuating flows and the lack of instream and riparian habitat. It is improbable any fish species would be capable of sustaining itself through a complete life cycle in Clear Creek between Golden and Youngfield Street. However, close attention should be paid to prevent the degradation of downstream habitat by increased siltation and decreased water quality.

At Youngfield Street, the stream channel becomes increasingly confined with riparian vegetation immediately adjacent to the water's edge, consisting of willows, cottonwood, and various grasses promoting fish food (insects) and shading (cooling) of the water (Plate 2). Instream substrate consists of cobble with some interstitial siltation. Critically low flows persist through the entire section (4.7 miles) in

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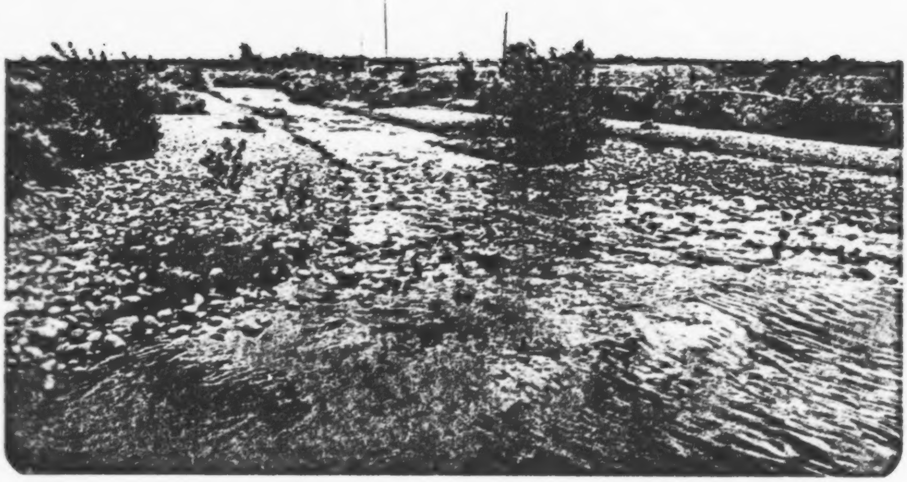

PLATE 1

BELOW SLOUGH DITCH DIVERSION - RESTRICTED
FLOWS AND LACK OF RIPARIAN VEGETATION

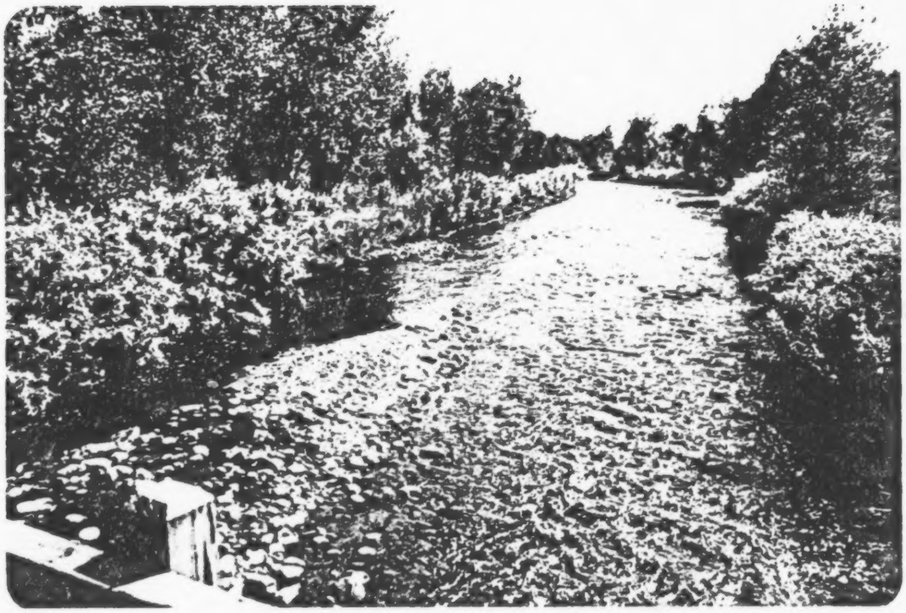

PLATE 2

PROSPECT PARK - OVERHANGING RIPARIAN
VEGETATION AND COBBLE SUBSTRATE

both September and January due to the Slough Association diversion and the rerouting of the Coors WWTP effluent to the Croke Canal, respectively. Intermittent riffles and pools are found throughout this section with the exception of the area impacted by I-76 construction at Wadsworth Boulevard which is expected to be temporary. In view of the existing flow conditions, the pools in this segment would aid in the fall and winter survival of the fish providing minimal eutrophication. Iron and copper concentrations periodically exceeded EPA criteria at Youngfield from mid-1976 to early 1977 (Section 2.4). No residual chlorine concentration findings have been recorded for this section of stream. Clear Creek between Youngfield Street and Wheat Ridge WWTP appears to be habitable by most warm water species. The parameter which would be the most limiting to a fishery in this section of stream would be the fluctuating late summer flows and possible high concentrations of iron and copper.

The overall quality of Clear Creek declines from the Wheat Ridge WWTP downstream to the South Platte River. The water becomes more turbid and the substrate consists mainly of silt and sparse cobble. There is a limited number of very small (shallow) riffles and the riparian vegetation is stunted and in short supply. Accumulations of natural and manmade litter are found throughout this section of the stream. Marginally adequate flows occur during the fall throughout this section of stream with the exception of the three miles of Clear Creek immediately above the South Platte River confluence. Where the water appears to be stagnant, an organic scum covers the water's surface which is possibly a result of leaching from nearby waste landfills (Plate 3). Concentrations of ammonia (un-ionized) have exceeded EPA criteria (of 0.02 mg/l) 300 meters downstream from the Wheat Ridge WWTP during August and December of 1976; at Sheridan Street and Pecos Street during June, August, and December of 1976; and at Broadway during February, August, and December of 1976. At York Street this criterion was exceeded during September and October 1971; between November 1972 and March 1973; between September 1974 and March 1975; from May to July 1975; from September 1975 to March 1976; from May 1976 to July 1976; from

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PLATE 3

BROADWAY - STAGNANT WATER WITH AN ORGANIC SCUM COVERING THE SURFACE

November 1976 to March 1977; from November 1977 to March 1978; during September 1978 and from November 1978 to March 1979. Total residual chlorine concentrations of 2.6 mg/l were measured on 10 November 1976 in the Wheat Ridge WWTP effluent and on 13 December 1976, 0.30 mg/l was measured in Clear Creek at Harlan Street by the Colordo Department of Health. A total residual chlorine concentration of .20 mg/l was detected in Clear Creek at the Sheridan Street bridge which was presumably originating at the Clear Creek Valley and Arvada WWTPs.

Clear Creek from the Wheat Ridge plant to the South Platte River appears to be the most unsuitable for a substantial fishery of any form due to a combination of localized excessive concentrations of total residual chlorine and unionized ammonia and restricted flows. Riparian habitat and instream substrate is also of poor quality.

Maximum summer water temperatures from Golden to the Wheat Ridge plant are marginally tolerable for cold water fish species based on EPA storet data. Below the Wheat Ridge plant these temperatures approach 75°F which is generally not suitable for cold water fish species survival. Throughout the entire length of Clear Creek (Golden to the South Platte River), the water temperatures are adequate for the survival of warm water species and ideal for various Cyprinids (minnows). Dissolved oxygen concentrations range from 6.5 to 14.1 mg/l which is well within the range of tolerance for both cold and warm water species. However, these dissolved oxygen concentrations may not reflect oxygen sags during the night, especially below sewage treatment plants. Measurements of pH throughout Clear Creek between Golden and the South Platte River lie within the EPA criterion range for freshwater aquatic life which is 6.5-9.0.

2.5.4 Chemical Stream Characteristics Specific to Aquatic Life

The only chemical parameters which are presently threatening the quality of aquatic life in the lower segment of Clear Creek are unionized ammonia and total residual chlorine. Ammonia has long been recognized as toxic to fish (Belding, 1927; Grindley, 1946). The ammonia toxicity to fish depends on the portion of un-ionized ammonia in solution which increases with temperature and pH. Un-ionized ammonia can also reach toxic levels in highly alkaline waters. Although coarse fish such as Carp survive longer in toxic solutions than salmonids, differences in sensitivity among the species is probably small at prolonged exposure (European Inland Fisheries Advisory Commission, 1970).

Laboratory experiments have demonstrated that lethal concentrations at relatively short periods of exposure for a variety of fish species ranges from 0.2 to 2.0 mg/l NH_3. The EPA criterion of 0.02 mg/l NH_3 was established to protect any aquatic organisms not yet examined for sensitivity.

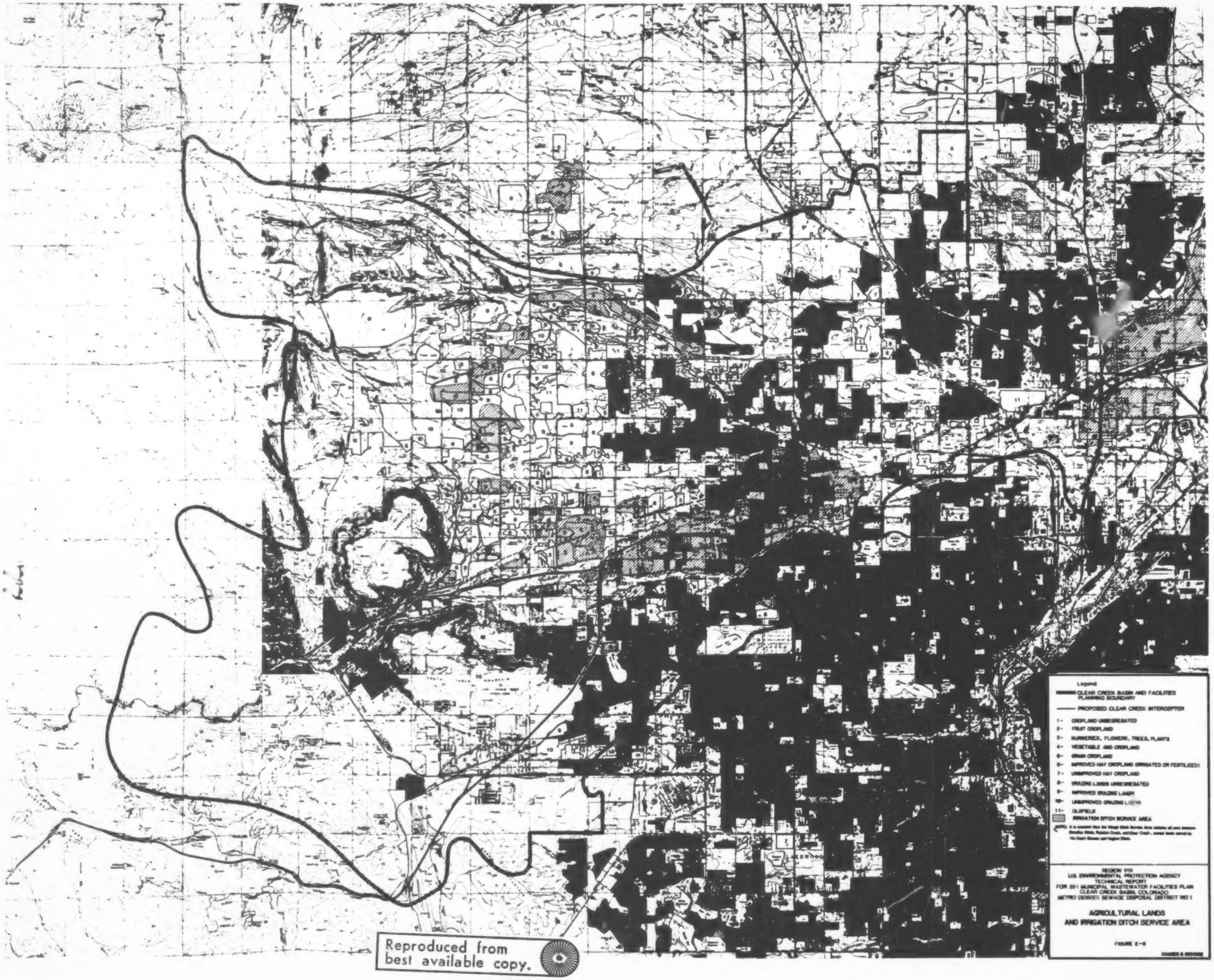
Total residual chlorine is acutely toxic to various species of fish at different concentrations providing the fish are continually exposed. Arthur (1972) found that fifty percent of the White Suckers, Largemouth Bass, and Fathead Minnows perished after 96 hours of continuous exposure to concentrations ranging from 0.09 to 0.30 mg/l total residual chlorine. Zillich (1972) found that fish held under continuous flow conditions at Michigan treatment plants demonstrated that residual chlorine is not extremely toxic for short periods of exposure. Fish were found to survive in concentrations of chlorinated wastewater of 25 percent for 2 or 3 hours, 16 percent for 12 hours, and 7 percent for 24 hours (Zillich, 1972). Based on the following two findings, (1) total residual chlorine rapidly dissipates after entering the stream and (2) fish are known to avoid toxic materials that are well below the concentrations required to show toxic symptoms, it is apparent that only short segments of the stream (below sewage treatment plants) are void of fish and that any variations in the concentrations of total residual chlorine at the effluent will probably not cause massive fish kills.

2.6 AGRICULTURAL LANDS

An inventory was performed in July and August 1980 to identify all agricultural lands in the Clear Creek Basin. June 1980 aerial photography was analyzed and field checked. All agricultural parcels exceeding approximately four acres were identified and classified by type of agricultural activity.

Included in the inventory were lands classified as "oldfield," which are lands that were identified as having recently been cultivated, but which have been abandoned and are not currently in production. Fallow lands, by contrast, are lands not currently being cultivated, but which are in rotation. Fallow lands were included in the unsegregated cropland category. A description of each category of agricultural lands is presented below. Agricultural lands are mapped in Figure 2-8.

Category	Description
Unsegregated Cropland	General category for fallow land and land in cultivation, including for hay and alfalfa, wheat, barley, grapes, orchards, vegetables, etc., for which no specific crop has been identified.
Oldfield	Recently abandoned croplands
Vegetable Cropland	Cultivated vegetables
Grains Cropland	Grains: wheat, barley, etc.
Nurseries	Trees, flowers, and plants, including greenhouses
Fruit Cropland	Cultivated fruits (apples, grapes, etc.)
General Grazing	Lands used for grazing horses, cattle, hogs, etc.
Improved Grazing	Fertilized, irrigated, or otherwise improved for grazing
Unimproved Grazing	Grazing lands not maintained; these are not generally intensively grazed.
Hay Cropland (improved or unimproved)	Includes alfalfa hay


Legend
CLEAR CREEK BASIN AND FACILITIES PLANNING BOUNDARY
PROPOSED CLEAR CREEK INTERCEPTOR
1– CROPLAND UNSEGREGATED
2– FRUIT CROPLAND
3– NURSERIES, FLOWERS, TREES, PLANTS
4– VEGETABLE AND CROPLAND
5– GRAIN CROPLAND
6– IMPROVED HAY CROPLAND (IRRIGATED OR FERTILIZED)
7– UNIMPROVED HAY CROPLAND
8– GRAZING LANDS UNSEGREGATED
9– IMPROVED GRAZING LANDS
10– UNIMPROVED GRAZING LANDS
11– OILFIELDS
▨ IRRIGATION DITCH SERVICE AREA
NOTE: [illegible]

REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL REPORT
FOR 201 MUNICIPAL WASTEWATER FACILITIES PLAN
CLEAR CREEK BASIN, COLORADO
METRO DENVER SEWAGE DISPOSAL DISTRICT NO 1

AGRICULTURAL LANDS
AND IRRIGATION DITCH SERVICE AREA

FIGURE 2-8

DAMES & MOORE

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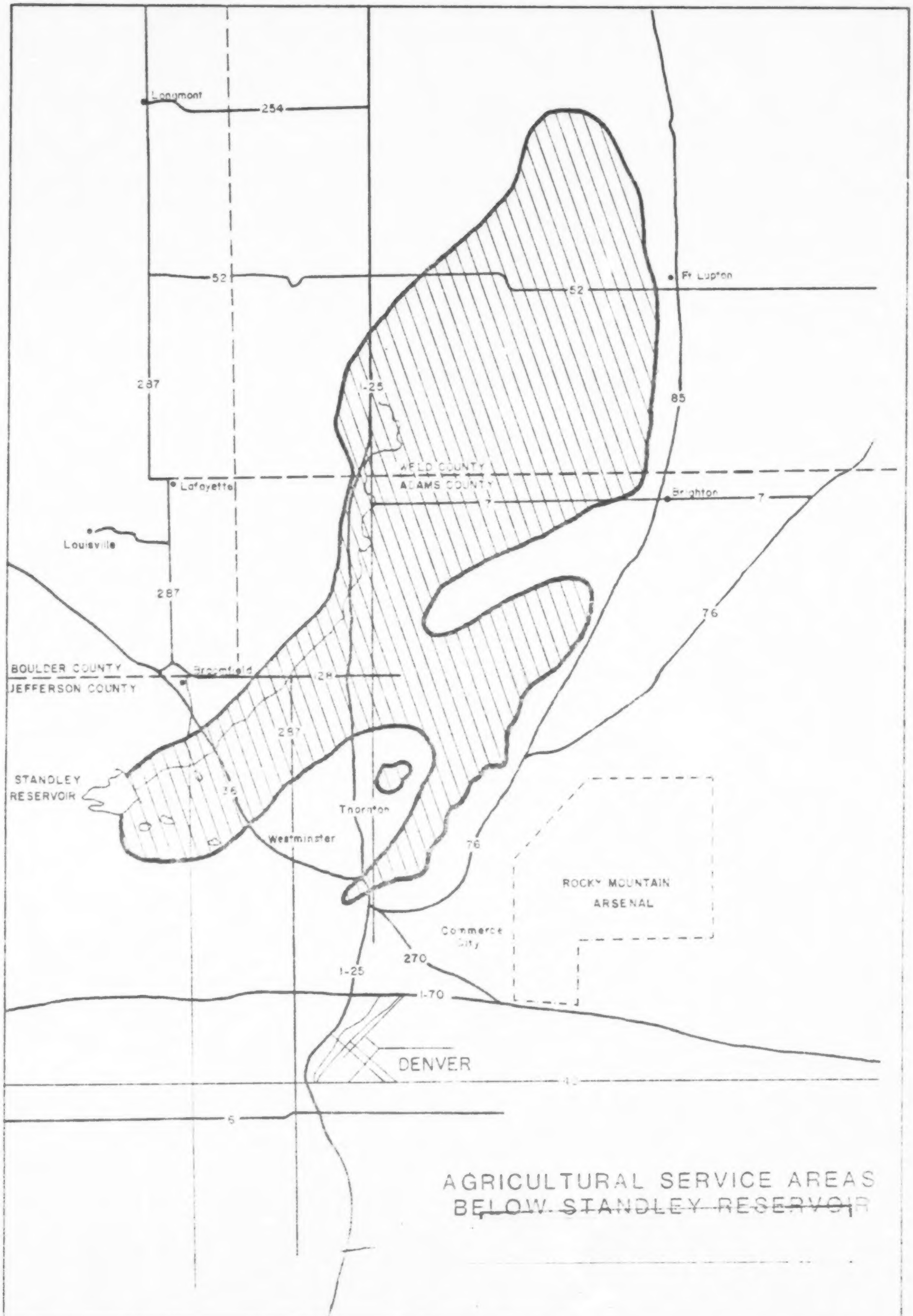
Agricultural parcels within the urbanized portions of the Clear Creek Basin are generally quite small, with very few exceeding ten acres. The primary uses of the urban areas parcels are horse grazing, hay and alfalfa, nurseries, and truck gardens. It is unlikely that, with the exception of nurseries, these parcels actually produce a profit for the owners; most are cultivated and grazed for pleasure. Agricultural parcels in the fringe areas (such as the area between Easley Road and McIntyre in Golden, western Adams County, and north of Arvada) are generally larger and are devoted to a variety of agricultural uses. Many of these parcels are farmed for profit.

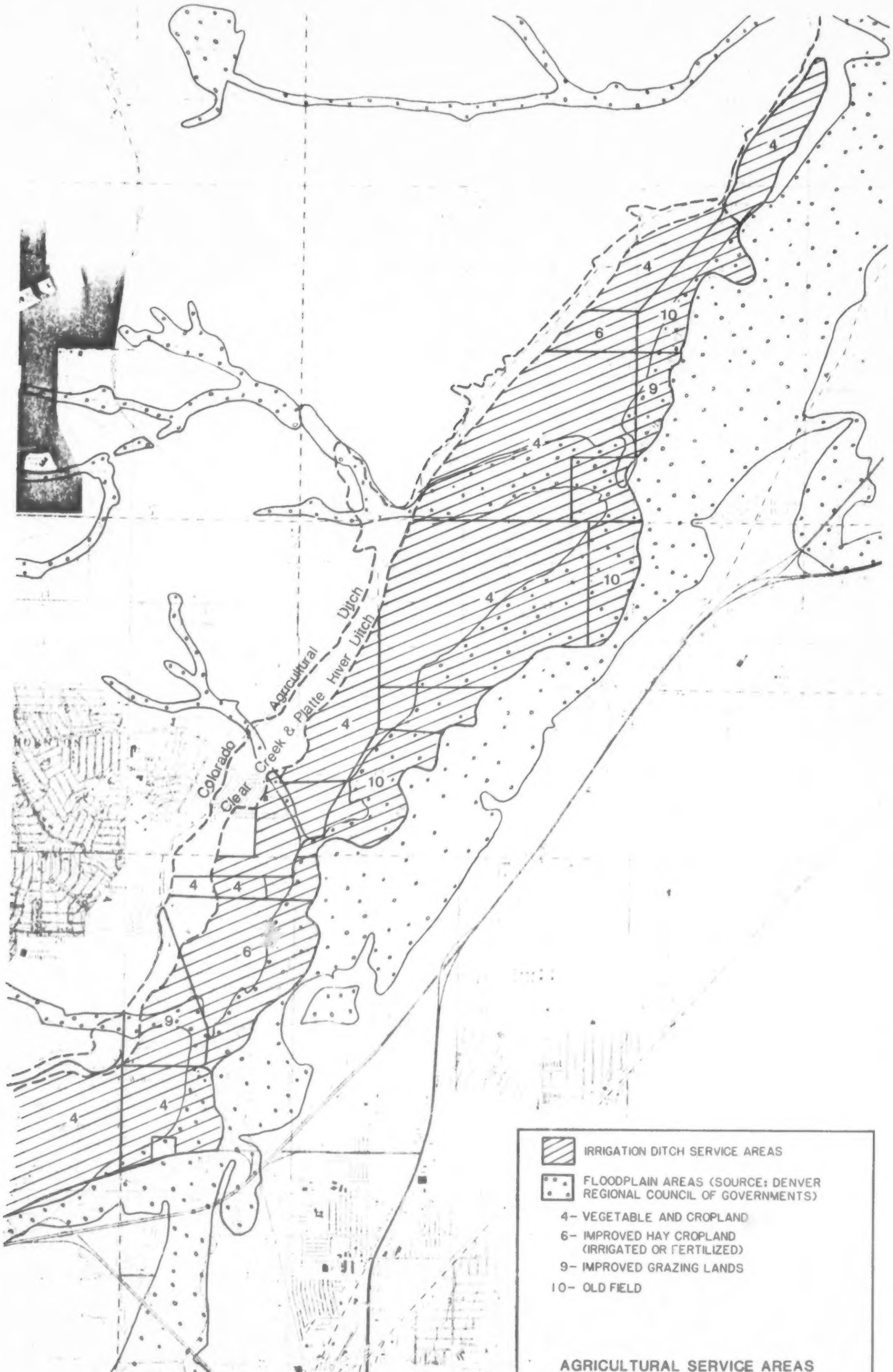
Irrigation ditches service many of the parcels in the Clear Creek Basin and its environs. The service areas of the irrigation ditches that derive water from Clear Creek were determined through interviews with officials of the several ditch companies. It is important to note that the records of ditch companies on irrigation parcels are generally incomplete. The service areas of the various ditch companies, shown in Figure 2-8, include only the larger irrigated parcels. In the case of several irrigation ditches (Welch, Agricultural, Slough, Reno and Juchem, Colorado Agricultural, and Oulette Ditches), very general or no information on service areas could be obtained. Therefore, assumptions had to be made concerning the service areas of some ditches, such as the Slough and Colorado Agricultural ditches. Approximately 4,352 acres of agricultural land serviced by Clear Creek irrigation ditches were identified; 3,046 acres were located within the service areas of the Colorado Agricultural and Clear Creek and Platte River Ditches.

A general agricultural service area is shown in Figure 2-9 for lands serviced by Standley Reservoir and Farmers Highline Canal, which passes just below the reservoir (Anderson, et al., 1976). These lands are served primarily by Clear Creek Water. Also, the service areas of Clear Creek and Platte River and Colorado Agricultural Ditches are shown in Figure 2-10, extending to the north of Clear Creek Basin along the South Platte River in Adams County.


Longmont
254
52
Ft Lupton
52
287
I-25
85
WELD COUNTY
ADAMS COUNTY
Lafayette
Brighton
7
7
Louisville
287
76
BOULDER COUNTY
JEFFERSON COUNTY
Broomfield
36
287
STANDLEY RESERVOIR
36
Thornton
Westminster
76
ROCKY MOUNTAIN ARSENAL
Commerce City
270
I-25
I-70
DENVER
40
6

AGRICULTURAL SERVICE AREAS
BELOW STANDLEY RESERVOIR

FIGURE 2-9


Colorado Agricultural Ditch
Clear Creek & Platte River Ditch
4
6
9
10
▨ IRRIGATION DITCH SERVICE AREAS
⁘ FLOODPLAIN AREAS (SOURCE: DENVER REGIONAL COUNCIL OF GOVERNMENTS)
4- VEGETABLE AND CROPLAND
6- IMPROVED HAY CROPLAND (IRRIGATED OR FERTILIZED)
9- IMPROVED GRAZING LANDS
10- OLD FIELD
THORNTON
COMMERCE CITY

AGRICULTURAL SERVICE AREAS
-CLEAR CREEK AND PLATTE RIVER
AND COLORADO AGRICULTURAL DITCHES

DAMES & MOORE

FIGURE 2-10

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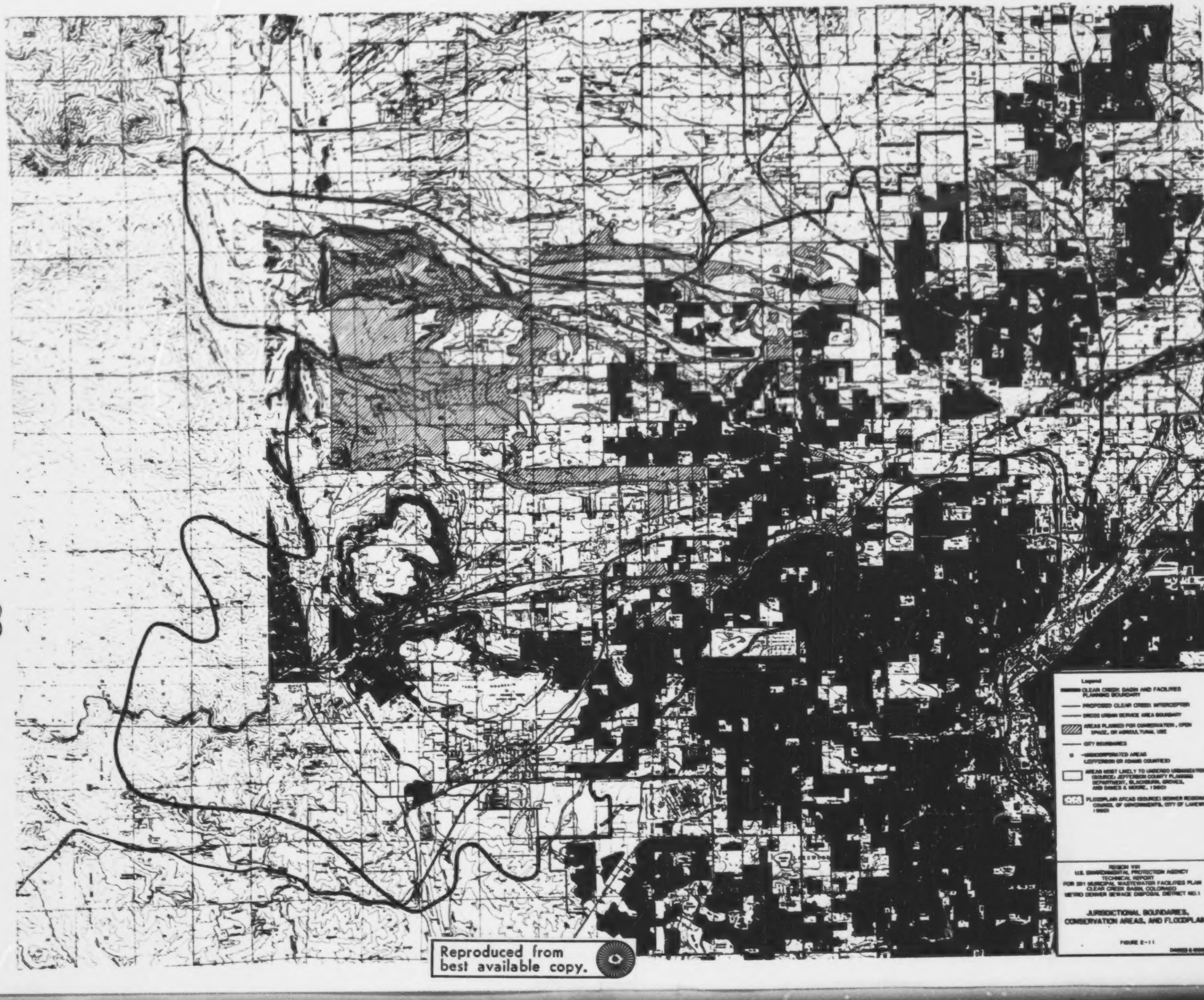
Examination of land use plans of the several agencies with jurisdiction in the Clear Creek Basin indicates that much of the existing agricultural land is planned to be developed for urban or park land uses. The following is a discussion of local agencies and plans relevant to agricultural land conversion within the basin. Figure 2-11 shows jurisdictional boundaries.

Denver Regional Council of Governments (DRCOG). DRCOG is an areawide planning agency responsible primarily for program implementation and evaluation of grant applications for infrastructure investments in the Denver metro region. Its influence on local land use planning occurs through its review of infrastructure investment grant applications (primarily federal water and sewer system grant applications), but DRCOG has no statutory land use policy implementation powers. DRCOG's Regional Growth and Development Plan (RGDP) (1978, with subsequent amendments) contains general policy guides for its grant application review function. In this plan, general geographical areas are identified in which urban development is desirable, called "future service areas." Generally, the City of Golden is included within the future service area, as are Wheat Ridge and Arvada and most areas east of Indiana Street. The DRCOG future service area boundary is depicted in Figure 2-11. In areas outside (to the west of) the future service area boundary, the RGDP states that "agriculture, forests, and other open space uses should be the primary use of the land." Within the future service area boundary, however, some areas are limited for development by factors such as shrink-swell soils, floodplains, subsidence hazard areas, and slope. The RGDP, however, is used as a general guideline; in many areas within the future service area boundary, local governments have planned for conservation uses, as is shown in Figure 2-11. Local plans are generally more specific than the RGDP and in many cases are probably better predictors of future land use.

City of Wheat Ridge. Clear Creek passes through Wheat Ridge for approximately 4.5 miles, and Reno and Juchem, Swadley and Slough Ditches service a few small agricultural parcels in the northwest part of the


Legend
CLEAR CREEK BASIN AND FACILITIES PLANNING BOUNDARY
PROPOSED CLEAR CREEK INTERCEPTOR
DRCOG URBAN SERVICE AREA BOUNDARY
AREAS PLANNED FOR CONSERVATION, OPEN SPACE, OR AGRICULTURAL USE
CITY BOUNDARIES
UNINCORPORATED AREAS (JEFFERSON OR ADAMS COUNTIES)
AREAS MOST LIKELY TO UNDERGO URBANIZATION (SOURCE: JEFFERSON COUNTY PLANNING DEPARTMENT, BLACKBURN, GROVES, AND DAMES & MOORE, 1980)
FLOODPLAIN AREAS (SOURCE: DENVER REGIONAL COUNCIL OF GOVERNMENTS, CITY OF LAKEWOOD, 1980)

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METRO DENVER SEWAGE DISPOSAL DISTRICT NO.1

JURISDICTIONAL BOUNDARIES, CONSERVATION AREAS, AND FLOODPLAINS

FIGURE 2-11

DAMES & MOORE

Reproduced from best available copy.

City of Lakewood. The Agricultural Ditch and Rocky Mountain Ditch traverse portions of northern Lakewood, but serve very few agricultural parcels. The Lakewood Comprehensive Plan does not reserve any areas for agricultural or conservation uses (Ospina, 1980).

Adams County. Much of the agricultural land serviced by agricultural ditches from Clear Creek are located in Adams County, but only a small portion are located within the Clear Creek Basin. The Adams County Comprehensive Plan (Adams County Planning Commission, 1975) is a generalized plan that designates the unincorporated area within the Clear Creek Basin for development. However, much of this area is in a floodplain, has been farmed by families for decades, and is unlikely to be developed (Perea, 1980).

2.7 USES FOR POTABLE WATER SUPPLY

Use of Clear Creek water for potable water supply occurs through two general methods: (1) ditch diversions of surface flow into storage, municipal water treatment plants, and potable storage and distribution systems, and (2) individual withdrawal from shallow wells in alluvium for home use as well as urban irrigation. Section 2.2 and Table 2-3 provide a complete presentation of Clear Creek diversions by municipalities. These data show the influence of Denver Water Board (DWB) supplies in the near western suburban areas of Wheat Ridge, Lakewood, and Arvada. Oulette Ditch diversions by Wheat Ridge are used raw for parks irrigation, with virtually all potable supplies coming from the DWB Denver system. Consolidated Mutual provides a portion of Lakewood's potable supply from Clear Creek diversions chiefly through Agricultural and Lee, Stewart and Eskins Ditches, but the bulk of their supplies come from the Denver system. Arvada is planning to supply some new development areas in its northwestern sector from Clear Creek diversions to newly constructed Blunn Reservoir but receives all but about one million gallons per day from raw DWB supplies in Ralston Reservoir and the Denver system at present. Also, Crestview Water and Sanitation District produces most of its potable supply from Kershaw Ditch diversions.

city. The city's Comprehensive Development Plan (City of Wheat Ridge, no date) designates virtually the entire city for urban-type development, except for greenbelts along Clear Creek and Lena Gulch and eight parks. No areas are designated for agricultural preservation.

City of Arvada. Clear Creek traverses Arvada for about one mile, and numerous agricultural ditches service lands within the city. The Arvada Comprehensive Plan (City of Arvada, 1979) covers areas both within the city and in the city's environs. Agricultural and conservation use designations are assigned to large areas of land southwest of Standley Lake and near Leyden Lake, Tucker Lake, and Blunn Reservoir. These areas are shown in Figure 2-11.

Jefferson County. Jefferson County's land use planning jurisdiction covers all unincorporated county areas, within which many of the agricultural ditches are located. The County Planning Department is currently completing a new County Comprehensive Plan (Jefferson County Planning Department, 1980) to replace its now-outdated plan. While this plan does not specifically designate particular areas for development, its preliminary land use suitability policies (not yet officially adopted by the Jefferson County Board of County Commissioners) can be interpreted through computer mapping to show areas that are most likely to undergo urbanization by the year 2000. This analysis is based on the inherent suitability of the land for development. Those areas with the highest suitability are assumed to be most likely to urbanize (Blackburn, Groves, and Dames & Moore, 1980). The policies set forth in the plan do not prohibit floodplain development. Since such development will certainly be highly restricted or prohibited, Figure 2-11 shows floodplain locations as well as areas rated likely to urbanize.

City of Westminster. The Farmer's Highline Canal services several agricultural parcels within the City of Westminster. The city is formulating a comprehensive land use plan, but no projection of its likely ultimate policies can currently be made (Loving, 1980).

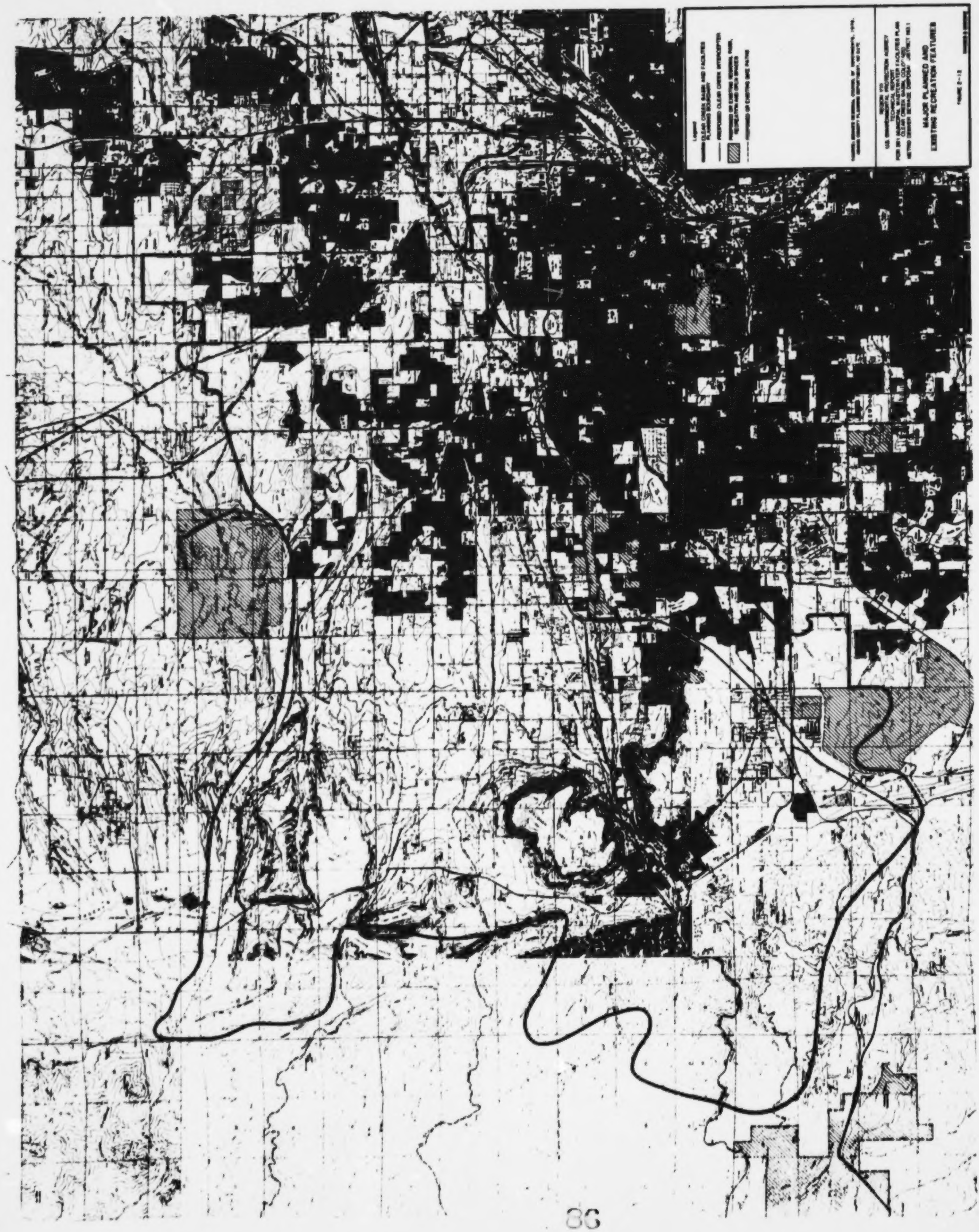
Other users of Clear Creek water for potable supplies are out-of-basin municipalities to the north and northeast of Clear Creek Basin, including Westminster, Northglenn, Thornton, and Broomfield. These municipalities divert water through Standley Reservoir, as described in Section 2.2. This trend is expected to continue in the future with Northglenn and Thornton phasing out direct diversions through Fisher, Colorado Agricultural, and Clear Creek and Platte River Ditches in favor of storage rights in Standley Reservoir.

The other category of potable water use, alluvial wells, involves over 700 domestic well supplies along the main steam of Clear Creek. This estimate was derived by reviewing the master well list provided by the State Engineers Office. Wells with recorded yields less than 50 gpm and less than 200 feet deep within the boundary of the Clear Creek alluvium were assumed to be domestic or light industry. All wells with individual ownership were assumed to be domestic. It is uncertain how many of these wells are used for potable supply in addition to urban irrigation. Two municipal supplies which come from wells in the alluvium are owned by Wheat Ridge Mutual Water Company and Valley Water District. An additional major well supply has been developed by Coors west of Youngfield Street, but it is used primarily in brewing (Figure 2-2). Wells used by Arvada for potable supply are deep, non-tributary wells.

2.8 RECREATION

The existing and proposed Clear Creek interceptors are located in a corridor that is planned to serve as a central axis for a regional recreation trails system. This trails system ultimately would provide linkages to the many parks that currently serve the residents of the Clear Creek Basin, as well as many of the parks planned for future construction. A map of major recreational trails and parks is displayed in Figure 2-12. The remainder of this section focuses on implementation mechanisms, particularly funding, for trails plans.

Funding for implementation of recreational trails plans is available from several sources. Local jurisdictions normally use general fund


Legend
CLEAR CREEK BASIN AND FACILITIES PLANNING BOUNDARY
PROPOSED CLEAR CREEK INTERCEPTOR
PROPOSED OR EXISTING BIKE PATHS
REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
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CLEAR CREEK BASIN, COLO.
METRO DENVER SEWAGE DISPOSAL DISTRICT NO. 1

MAJOR PLANNED AND EXISTING RECREATION FEATURES

FIGURE 2-12

monies to perform comprehensive trails planning, and can apply to the State Parks Board of the Parks and Outdoor Recreation Division of the Colorado State Department of Natural Resources for state funding for design, engineering, acquisition, and development expenses. However, no funds have been available from the state for the past three years (West, 1980).

Federal funding is available from the Department of Interior's Heritage Conservation and Recreation Service (HCRS). HCRS Land and Water Conservation funds are administered by the State Parks and Recreation Division, and are available on a 50-50 matching grant basis. The State Parks Board evaluates grant applications from local jurisdictions after the applications have completed A-95 review by DRCOG, the State Planning Division, and other agencies before forwarding applications to HCRS (West, 1980).

Federal funding for bikepaths is also available from the Federal Highway Administration on an 80-20 matching basis. These funds are administered by the Colorado State Highway Department. Grant applications are made by local jurisdictions to the State Highway Department, undergo A-95 review, and are forwarded with recommendations to the Federal Highways Administration. No funds have been appropriated by Congress for 1980, however (Kloos, 1980).

Funding for recreation trails is also available under Section 201 of the Clean Water Act, administered by EPA. The Act provides for funding for preparation of interceptor rights-of-way for recreational trails but not for top-coating, as part of the overall 75 percent federal grant.

In Jefferson County, funding for acquisition and development of parks and trails is available through the Jefferson County Open Space Program, which assesses a one-half cent county-wide sales tax. The funds are used for planning, acquisition, development, and maintenance of parks and trails, but not for major construction projects such as ballfields and swimming pools. The Jefferson County Open Space funds are allocated to municipalities as well as to the unincorporated areas (Keith, 1980).

Numerous local jurisdictions are involved in the planning and implementation of the planned trails and parks system. Each of the cities in the Clear Creek Basin area and Adams County use general fund monies and employ recreation and parks planners in the overall planning process. Other agencies that play important roles in recreation implementation are the Denver Regional Council of Governments (DRCOG), Jefferson County Open Space, the Parks and Outdoor Recreation Division of the Colorado Department of Natural Resources, and the Colorado State Highways Department. The roles of each jurisdiction are discussed below.

DRCOG. The DRCOG Regional Growth and Development Plan (RGDP) (1978 as amended) designates the major existing and proposed trail systems and park and recreation areas, as shown in Figure 2-12. The Clear Creek trail is planned to extend from its junction with the Platte River trail to the western border of Jefferson County, generally following Clear Creek for its entire length. Most of the Clear Creek trail has been completed between the Platte River and Youngfield Street. In the DRCOG RGDP, the Clear Creek trail connects with trails along Leyden and Ralson Creeks and the Platte River, affording hikers and bicyclists access to all areas in the western Denver metropolitan area.

DRCOG's roles in recreation planning are primarily A-95 review and intergovernmental coordination. As an A-95 review agency, DRCOG evaluates federal and state grant proposals by local governments for recreation funding, using the policies set forth in the RGDP as a general guideline. Clear Creek Basin area trails and parks facilities identified in the RGDP are depicted in Figure 2-12. DRCOG's coordination function is largely ad hoc in nature, involving communication with jurisdictions concerning funding opportunities and actions of other agencies. DRCOG does not provide local jurisdictions with funding for recreation implementation but does in some cases provide recreation planning assistance.

Jefferson County Open Space. Jefferson County Open Space is funded through a one-half cent county-wide sales tax and is charged with responsibility for land purchase and park planning and development in Jefferson County. The Jefferson County Open Space Non-Motorized Recreation Trails Plan (no date) calls for an extensive network of interconnecting trails which would connect all of the program's major parks. The Clear Creek Trail west of Youngfield Avenue is designated as a "Proposed Phase II" (design phase) trail in the Plan.

Parks and Outdoor Recreation Division, Colorado Department of Natural Resources (PORD). PORD formulated a recreational trails plan in 1974 (Colorado Department of Natural Resources, 1974) but is currently revising all recreation plans. The recreational trails plan, which is in accord with the DRCOG RGDP (Figure 2-12) is used by PORD to evaluate matching funding proposals from local jurisdictions. The western reaches of the proposed Clear Creek trail are likely to be afforded only a moderate priority once the new plan is completed since a primary criteria for funding will probably be location near or in the central Denver area (Mungan, 1980).

Colorado State Highway Department (CSHD). The CSHD works with local jurisdictions in the planning and design of bikeways associated with highway construction. Federal Highway Trust Fund moneys are available on a 90-10 matching basis. The I-76 bikeway is being constructed using these funds. As was previously noted, the CSHD also administers highway funds provided by the Federal Highways Administration (Sabin, 1980).

3.0 ALTERNATIVES

3.1 FACILITY PLAN ALTERNATIVES

As discussed in Section 1.0, the Facility Plan for Clear Creek examined two basic configurations for the basin-wide treatment system, the interceptor to the Central Plant, and various satellite plants. Variations in treatment processes, plant sites, service areas, and flow equalization systems yielded a preliminary list of eight alternatives for examination in the Facility Plan. An iterative screening process based on cost, engineering considerations, and implementation factors reduced the list to three alternatives which were examined more closely and compared on a present worth cost basis. Following preliminary screening and public involvement activities, two more alternatives were added involving higher levels of treatment for wastewaters discharged or reused in Clear Creek Basin. The Facility Plan concluded that the plan to parallel the Clear Creek interceptor where necessary to transport flow from the entire basin was the prefered alternative based on significant cost savings.

3.2 PROPOSED ALTERNATIVE

The proposed alternative described in the facility plan involves construction of a new interceptor parallel to the existing Clear Creek interceptor. This pipe will be reinforced concrete, ranging in size from 33" at the Applewood/Pleasant View connection at Youngfield Street to 72" at the siphon crossing of the South Platte River and inlet to the MDSDD treatment plant.

Under this plan, the existing municipal treatment plants at Arvada, Wheat Ridge, and Clear Creek Valley would continue to operate if economically feasible or until discharge standards require substantial rehabilitation or upgrading. However, the proposed alternative includes eventual abandonment of these plants.

3.3 TECHNICAL REPORT/FNSI ALTERNATIVE

During the planning process, numerous comments were made in favor of maintaining a wastewater treatment plant in the basin for flow augmentation and aesthetic purposes. In particular, the City of Golden identified return flow obligations on Clear Creek which it would be unable to satisfy without having its wastewater treated at an in-basin plant and discharged to Clear Creek. Recently, Golden has announced its intentions to associate with nearby Adolph Coors Company for treatment and discharge of its wastewater to Clear Creek using the existing Coors WWTP (Figure 2-1).

In view of this, the alternative evaluated in this study and summarized in the FNSI includes both the Clear Creek Interceptor and the Golden/Coors plant, In opting for treatment by Coors, Golden has advised MDSDD of its desire to sever ties with MDSDD (Goudge, 1980). Although the status of Golden's request is still uncertain due to MDSDD's responsibilities under State law (CRS Title 32, Part 5;32-4-515) in granting such a request, this study assumes that both the Clear Creek Interceptor and the Golden/Coors plant are included in the alternative or proposed project for review. The Golden/Coors plant will be locally funded, however, without federal participation.

The Clear Creek Interceptor is described in Section 3.2 above. The Golden/Coors plant will involve conversion of Coor's existing process WWTP (see Section 2.1) for use in treatment of municipal wastewater. The activated sludge plant has hydraulic capacity for 9.0 MGD average day flow, but has capacity for much greater organic loading than will be exerted by the largely domestic wastewater contributed by Golden and Coors (McNeill, 1980a).

The plant will receive a loading of about 2.15 MGD from Golden and Coors when it is converted in 1981 or 1982. Average flow in the year 2000 is expected to be about 3.00 MGD (Wheeler and Associates and Wright-

McLaughlin Engineers, 1974; MDSDD, 1980), far below plant capacity. The plant is designed to provide high quality secondard treatment (BOD/TSS of 20-30 mg/l), but with greatly reduced loadings, it may be possible to achieve some degree of ammonia conversion to nitrate.

Impact assessment for any other alternative configuration was beyond the scope of this study.

4.0 IMPACTS

In this section, the basic flow analysis approach applied to existing conditions in Section 2.0 is extended to predict streamflow conditions in the year 2000. Besides effects of the project on streamflow, future changes in diversion patterns are factored into the analysis to produce as realistic a picture of future conditions as possible. The impact analyses for Water Quality, Water Rights, Aquatic/Fisheries, and Agricultural Lands follow from and utilize the results of this analysis.

Pre-1967 conditions are also discussed and analyzed in this section to provide insight into the effects of the original Clear Creek interceptor (operable in 1967) on streamflows.

4.1 WASTEWATER TREATMENT

4.1.1 Facilities

In the year 2000, wastewater treatment facilities operating in the Clear Creek Basin will include the existing interceptor and proposed project (Section 3.3), the Coors process wastewater plant, and the Northwest Lakewood primary plant, which discharges to the existing interceptor. In addition, the three existing municipal secondary plants--Arvada, Wheat Ridge, and Clear Creek Valley--which discharge effluents to Clear Creek may be operating. Total discharges to Clear Creek will vary from 9.5 MGD to 15.0 MGD and discharges to the Clear Creek Interceptor from 21.3 MGD to 26.8 MGD, depending on the status of the existing in-basin municipal plants. The total of Clear Creek Basin wastewater flows will be 36.3 MGD.

4.1.2 Fate of In-Basin Municipal Plants

The Clear Creek Interceptor pre-design includes capacity sufficient to take all wastewaters now treated at the Arvada, Wheat Ridge, and Clear Creek Valley (In-Basin) WWTP's. The reasoning for providing this excess capacity was the Facility Plan (CH2M Hill, 1977) cost-effectiveness analysis, which showed the interceptor to be less costly compared to new in-basin treatment plants. Since all the In-Basin WWTP's are at least 20 years old, it was assumed they will need replacement or extensive refurbishment during the planning period, the costs of which will be high compared to abandonment and use of the MDSDD interceptor.

Streamflow maintenance benefits of the In-Basin WWTP's were considered to be outweighed by cost considerations in the Facility Plan analysis. These streamflow effects are dealt with in detail in the following sections.

Wastewater reuse was only considered for the regional in-basin plants included in the Facility Plan alternative analysis. MDSDD recommended that additional planning monies be made available so that governmental units which operate existing In-Basin WWTP's can investigate the potentials for continued operation or upgrading and effluent reuse (CH2M Hill, 1977). To date, no additional facilities planning activities have been initiated through MDSDD, although interest has been expressed by Clear Creek Valley Water and Sanitation District and the City of Arvada has made a request for funding priority directly to EPA.

A preliminary reclamation study was prepared for Arvada (Wright-McLaughlin Engineers, 1979) which identified about one MGD of non-tributary well water which returns to Clear Creek at the Arvada WWTP and could be reused for urban irrigation or discharged to Clear Creek and exchanged for additional direct flow diversions from Clear Creek. No action has been taken on this proposal by Arvada to date.

The proposed in-stream water quality standards for Clear Creek (Colorado Department of Health, 1980) will have an important bearing on all Clear Creek Basin wastewater management activities, including the Golden/Coors and Coors process waste plants. These standards, described in more detail in Section 4.4, are more stringent than present standards. Proposed standards would require upgrading of the existing In-Basin WWTP's for nitrogen control as a minimum. Exact calculations of new effluent limitations will be the responsibility of DRCOG, once the standards are approved. The effect of upgrading requirements would probably be to assure closure of the In-Basin WWTP's; the Golden/Coors plant (converted existing process waste plant) will probably require upgrading prior to initial use for municipal wastewater treatment and discharge to Clear Creek in 1981 or 1982. The best opportunity for continued operation of the In-Basin WWTP's would be in schemes involving year-round diversion for reuse and no discharge to Clear Creek.

4.1.3 Reuse of MDSDD Central Plant Effluent

By the year 2000, as noted in Section 4.1.1, as much as 74 percent or 26.8 MGD of Clear Creek Basin wastewater will be treated at the MDSDD Central Plant. A large portion of MDSDD plant flows including those from Clear Creek Basin originate from trans-mountain water supplies provided by the Denver Water Board (DWB). DWB has plans for reuse of about 100 MGD of trans-mountain sewage return flow in its potable water system by about 1995. This will involve construction of high technology reclamation facilities near the MDSDD Central Plant, including a 1 MGD demonstration plant operable by about 1985.

4.2 DIVERSIONS AND WATER RIGHTS

4.2.1 Diversion Records

An operations study was performed, using data for the water year 1977, to see what effect the project might have on ditch diversions within the Clear Creek basin. The year 1977 was selected as the study year because it is the lowest streamflow year for which a complete set of discharge records, diversion records and call records are available. The year 1977 is the third lowest streamflow year on record with lower flows recorded in 1954 and 1963. The 1977 diversion records for each of the 25 active ditches downstream of and including the Welch Ditch headgate are summarized in Table 2-7. Most diversions do not begin until April or May and cease during the month of November.

4.2.2 Operations Study Parameters

Quantification of streamflow changes which are expected to occur because of changes in sewage effluent return patterns are discussed in section 4.3 of this report. This section discusses the assumptions that are used in identifying the ditches which are benefited or injured and in quantifying the amount of benefit or injury. Several of the assumptions are applicable to all months while some only apply to specific months. The specific months of water year 1977 for which the operations study was developed are January, March, May, August, September and October.

The three general assumptions made are: 1) that diversions and streamflows would be the same in a dry year in the future as they were in 1977; 2) that any flow changes attributable to the various proposed and decreed augmentation plans would be minor; 3) that the Croke Canal will divert all water that is legally available under its 1902 priority whenever the water is physically available at its headgate. It is not known how long the first assumption may remain valid in that Clear Creek is currently in the process of changing from a source of supply for primarily agricultural interests to a source of supply for primarily municipal and industrial interests. It is also possible that, in 1977, municipal and industrial interests were not actively using water rights which they have purchased and plan on using in the future. The extent of water rights being held inactive is not known and therefore any potential effect on streamflow conditions resulting from the future use of such rights cannot be quantified at this time. However, to the extent that the first assumption remains valid, the second and third assumptions should be accurate. Assumptions applicable to each of the individual months are as follows.

January and March

The same conditions exist on the creek for both of these months; therefore, they will be discussed simultaneously. In both months the Croke Canal is diverting water for eventual storage in Standley

Reservoir. When the Croke Canal is diverting, it generally takes the entire streamflow, thereby drying up the stream immediately below the canal headgate. The only water being diverted downstream is at the Fisher Ditch headgate. Since the creek is dry directly below the Croke Canal, the Fisher Ditch is completely satisfied by return flows. Also, since the water diverted at the Fisher Ditch headgate appears to be an old agricultural right that is being used by Public Service Company for its Cherokee Plant, there is a possibility that this is an undecreed use and therefore the Fisher Ditch is not able to call out the Croke Canal.

Thus, any additional flows introduced to the creek upstream of the Croke will be diverted by the Canal. Any decrease in streamflows below the headgate of the Croke Canal will be borne by either the creek or by the Fisher Ditch. As stated earlier, it is doubtful that the Fisher Ditch could pass the effect of any injury sustained to any other ditch.

May

In May there were six days when the Clear Creek and Platte River Ditch had its 11-1-1861 call on the creek, eleven days when the Colorado Agricultural Ditch had its 11-5-1863 call on the creek, and three days when the Colorado Agricultural Ditch had its 3-5-1867 call on the creek. During the rest of the month the calls emanated from ditches on the South Platte River. On most of the days when the South Platte Ditches called for water, there was water flowing past the Clear Creek and Platte River Ditch headgate. Also on all the days when the Colorado Agricultural Ditch calls and the Clear Creek and Platte River Ditch calls were on the river, there were several other upstream ditches diverting on more junior priorities.

Based on the above conditions, the following assumptions are made. Whenever one of the ditches on the South Platte River is the only call on the creek, any changes in streamflow on Clear Creek will accrue to the

South Platte River. Whenever the calling ditch is the Colorado Agricultural Ditch or the Clear Creek and Platte River Ditch, and there is a net increase in streamflow that increase will accrue to the calling ditch first and possibly the South Platte River. Whenever the calling ditch is the Colorado Agricultural Ditch or the Clear Creek and Platte River Ditch and there is a net decrease in streamflow, that decrease will accrue to one of the upstream diverters as a result of that diverter being required to reduce his diversions in order to satisfy the need of the calling ditch. It cannot be determined who the decrease might accrue to unless the diversion records of all of the diverters in the entire Clear Creek Basin are examined.

August

During the month of August the Clear Creek and Platte River Ditch's 11-1-1861 call was on the river for 26 days; the Fisher Ditch's 6-29-1861 call was on the river for three days; and the Swadley Ditch's (part of the Slough Association) 5-14-1861 call was on the river for seven days. There were times when both the Fisher Ditch and the Clear Creek and Platte River Ditch were calling and there were other times when both the Swadley Ditch and the Clear Creek and Platte River Ditch were calling.

Based on the above conditions, the following assumptions are made. Whenever the Clear Creek and Platte River call is the only call on the creek below the proposed Golden/Coors plant, all changes in streamflow will accrue to the Clear Creek and Platte River Ditch. Whenever the Fisher call is the only call on the creek below the proposed Coors/Golden Plant and when both the Fisher call and the Clear Creek and Platte River call are on the river simultaneously, all changes in streamflow will accrue to the Fisher Ditch. Whenever the Swadley call is the only call on the creek below the proposed Golden/Coors Plant or when the Swadley call and the Clear Creek and Platte River call are being exercised simultaneously, all increases in streamflow will accrue to the Swadley Ditch Slough Association until the diversions total 11.077 cfs.

All of the remaining increases in streamflow will then accrue to the Fisher Ditch and possibly the Clear Creek and Platte River Ditch. All decreases in streamflow below the Slough Association Ditch headgate will accrue to the Fisher Ditch and possibly the Clear Creek and Platte River Ditch.

September

During the month of September the Swadley Ditch's 5-14-1861 call was on the creek for 22 days while the Fisher Ditch's 6-19-1861 call was on the creek for eight days. Based on the above conditions, the following assumptions are made. Whenever the Swadley call is the only call on the creek below the proposed Golden/Coors Plant, all increases in streamflow will accrue to the Swadley Ditch until the Slough Association diversions total 11.077 cfs. All of the remaining increases in streamflow will then accrue to the Fisher Ditch and possibly the Clear Creek and Platte River Ditch. All decreases in streamflow below the Slough Association Ditch headgate will accrue to the Fisher Ditch and possibly the Clear Creek and Platte River Ditch. Whenever the Fisher Ditch call is the only call on the creek below the proposed Golden/Coors Plant, all changes in streamflow will accrue to the Fisher Ditch and possibly the Clear Creek and Platte River Ditch.

October

During the month of October the Fisher Ditch's 5-14-1861 call was on the creek throughout the month. Based on this condition, the following assumption was made. Whenever the Fisher Ditch call is the only call on the creek below the proposed Golden/Coors Plant, all changes in streamflow will accrue to the Fisher Ditch and possibly the Clear Creek and Platte River Ditch.

4.2.3 Impacts Summary

Impacts on water rights and diversions are summarized in this section for the three general flow regime periods--winter, runoff season, and late summer/fall irrigation season. Streamflow and diversion impacts for the low flow irrigation season are quantified in Section 4.3.

Croke Canal benefits from increases in direct sewage discharges from the Golden/Coors plant in the winter. Although depletions would accrue to Fisher Ditch in winter, calculations based on January 1977 flows (Table 2-4 in Section 2.3) show adequate streamflow for satisfying Fisher Ditch needs, even if the in-basin WWTPs close.

The situations for the runoff and later summer/fall irrigation seasons are shown in Table 4-1. Fisher and Slough Association Ditch diversions are affected in the later irrigation season. Changes in WWTP discharges will affect Colorado Agricultural and Clear Creek and Platte River Ditch (CCPRD) diversions in both the runoff and late summer/fall irrigation seasons. Substantial adverse impacts will accrue to the Fisher Ditch, Colorado Agricultural Ditch, and CCPRD as a result of the project if the Wheat Ridge, Arvada, and Clear Creek Valley WWTPs close down.

4.3 STREAMFLOWS

4.3.1 Methodology

To evaluate the impacts of the proposed MDSDD interceptor on streamflows, five conditions are considered. Condition 1 is the existing condition, where 1975 was intended to be the base year. However, as mentioned previously, available data was insufficient to analyze 1975 (an average year), and therefore 1977 (a dry year) was analyzed on a monthly basis. Although the specific flow amounts differ in a dry versus an average year, the flow regimes are similar. That is, wastewater inflows are essentially the same, and reaches of the stream that undergo low flows in a dry year also undergo low flows in an average year. Therefore, except for specific flow quantities, it is felt that either 1975 or 1977 may be considered the base year. The flow quantities that change are the amounts of water taken from the stream, and in general the conditions downstream of the headgates are the same in a dry versus average year.

TABLE 4-1

EFFECTS OF PROJECT ON WATER RIGHTS

	Season Affected			
	Runoff		Late Irrigation	
Affected Ditch	Conditions 2 & 4	Conditions 3 & 5	Conditions 2 & 4	Conditions 3 & 5
Slough Association	o	o	+	+
Fisher	o	o	+	-*
Lower Clear Creek and Platte River	+	-*	+	-*
Colorado Agricultural	+	-*	+	-*

Notes: See Section 4.3 for definitions of conditions

+ = diversions increase due to project

- = diversions decrease due to project

o = no effect

* = significant impact

Condition 1 = Present situation, 1975/1977.

Condition 2 = Present conditions with project in place and existing in-basin plants open.

Condition 3 = Present conditions with project and in-basin plants closed.

Condition 4 = Year 2000 with project and in-basin plants open.

Condition 5 = Year 2000 with project and in-basin plants closed.

For conditions 2 through 5, the Golden/Coors plant is assumed to be in operation. Thus the combined domestic wastewater of Coors and Golden is treated and discharged to Clear Creek. Coors' process water will be discussed as a different WWTP but will discharge in the same location as the domestic wastewater.

With the above discussion implemented, condition 2 is the existing situation with all WWTP's operating. Condition 3 is the existing situation with the Wheat Ridge, Clear Creek Valley and Arvada plants closed. Condition 4 is the year 2000 with the plants open, while condition 5 is the year 2000 with the plants closed. These conditions are also listed in Table 4-1.

To project the year 2000 conditions, it was necessary to estimate the future discharges of the WWTP's. MDSDD has estimated the Golden discharge at 3,350 A-F (3.0 MGD) for the year 2000 (McNeill, 1980b). The Wheat Ridge WWTP discharge will increase slightly to 2,850 A-F (2.5 MGD) (Williams, 1980). Discharges from the Arvada WWTP were assumed to remain constant at the 1977 level, 910 A-F (Adams, 1980). The Clear Creek Valley WWTP has no information as yet as to future flows (Michna, 1980). Therefore, we have assumed that the plant will continue at its present capacity of 2,350 A-F (2.1 MGD). The Coors process water flows are assumed to continue at their 1977 level of 4,030 A-F (3.6 MGD). In actuality, Coors is anticipated to double production and thereby double the amount of treated process water. However, we have assumed that they will increase their demands on Clear Creek by an amount that balances the increased wastewater discharge and therefore a net streamflow change of zero occurs.

The effect of the proposed interceptor, with respect to both total and native flows, can be analyzed on an annual basis for the whole of Clear Creek without difficulty. The analysis is presented in Table 4-2. The native flows were calculated on the basis of percentages presented in the Leonard Rice (1978) water rights study. The Coors process water is assumed to be 100 percent native (Jaquet, 1980).

TABLE 4-2

ANNUAL CHANGES IN FLOW ON CLEAR CREEK WITH MDSDD INTERCEPTOR AND GOLDEN/COORS PLANT*

ACTIVITY AFFECTING CLEAR CREEK	CONDITION 1 EXISTING SITUATION (1975)	CONDITION 2 1975 PLANTS OPEN	CONDITION 3 1975 PLANTS CLOSED	CONDITION 4 2000 PLANTS OPEN	CONDITION 5 2000 PLANTS CLOSED
	(all values in acre-feet per year)				
TOTAL FLOWS					
Discharges to Clear Creek					
Golden/Coors	0	2,400	2,400	3,350	3,350
Coors	4,000	4,000	4,000	4,000	4,000
Wheat Ridge	2,560	2,560	0	2,850	0
Clear Creek Valley	1,460	1,460	0	2,350	0
Arvada	970	970	0	910	0
Total	8,990	11,390	6,400	13,460	7,350
Change from Condition 1	0	+2,400	-2,590	+4,470	-1,640
NATIVE FLOWS					
Discharges to Clear Creek					
Golden/Coors	0	2,330	2,330	2,850	2,850
Coors	4,000	4,000	4,000	4,000	4,000
Wheat Ridge	0	0	0	60	0
Clear Creek Valley	0	0	0	190	0
Arvada	0	0	0	130	0
Total	4,000	6,330	6,330	7,230	6,850
Change from Condition 1	0	+2,330	+2,330	+3,230	+2,850

*1975 is used as the base year in this table only in order to maintain consistency with the previous Leonard Rice Report (1978).

With respect to Clear Creek as a whole, the MDSDD interceptor, in combination with the Golden/Coors plant, increases the amount of native water in the creek. However, if the existing WWTP's are closed (conditions 3 and 5 in Table 4-2), the total flow available is reduced by 2,590 A-F and 1,640 A-F for the years 1975 and 2000, respectively.

The changes in flow that are shown on Table 4-2 do not affect all portions of Clear Creek. The locations of points of discharge are not the same under all conditions and the changes in flow are subject to the complex set of water rights that exist on Clear Creek. To identify specific reaches that either gain or lose flows, the creek must be examined in more detail. We have analyzed winter, late summer/fall irrigation, and runoff months.

4.3.2 Winter Streamflow

During the winter season (November through March), the effects of the MDSDD interceptor and Golden/Coors plant are fairly straightforward. Figure 2-3 and Table 2-4 characterize the flows for January, a typical winter month. The Croke Canal will divert all of the increase in flows that result from the Golden/Coors plant. If the existing WWTP's remain open (conditions 2 and 4) there would be no effect on Clear Creek; the existing (1977) winter conditions would continue. Under conditions 3 and 5 with the WWTP's closed, there would be critical low flows (less than 3 cfs) from the Croke Canal to Ralston Creek. From Ralston Creek to the Fisher Ditch the flow in Clear Creek would exceed the critical level, but the flow would be reduced from 1977 levels by the wastewater withheld, about 440 A-F per month. The Fisher Ditch would reduce the flow to below the critical level. Downstream of the Fisher Ditch the natural gains would again increase the flow to above critical.

4.3.3 Late Irrigation Season Streamflow

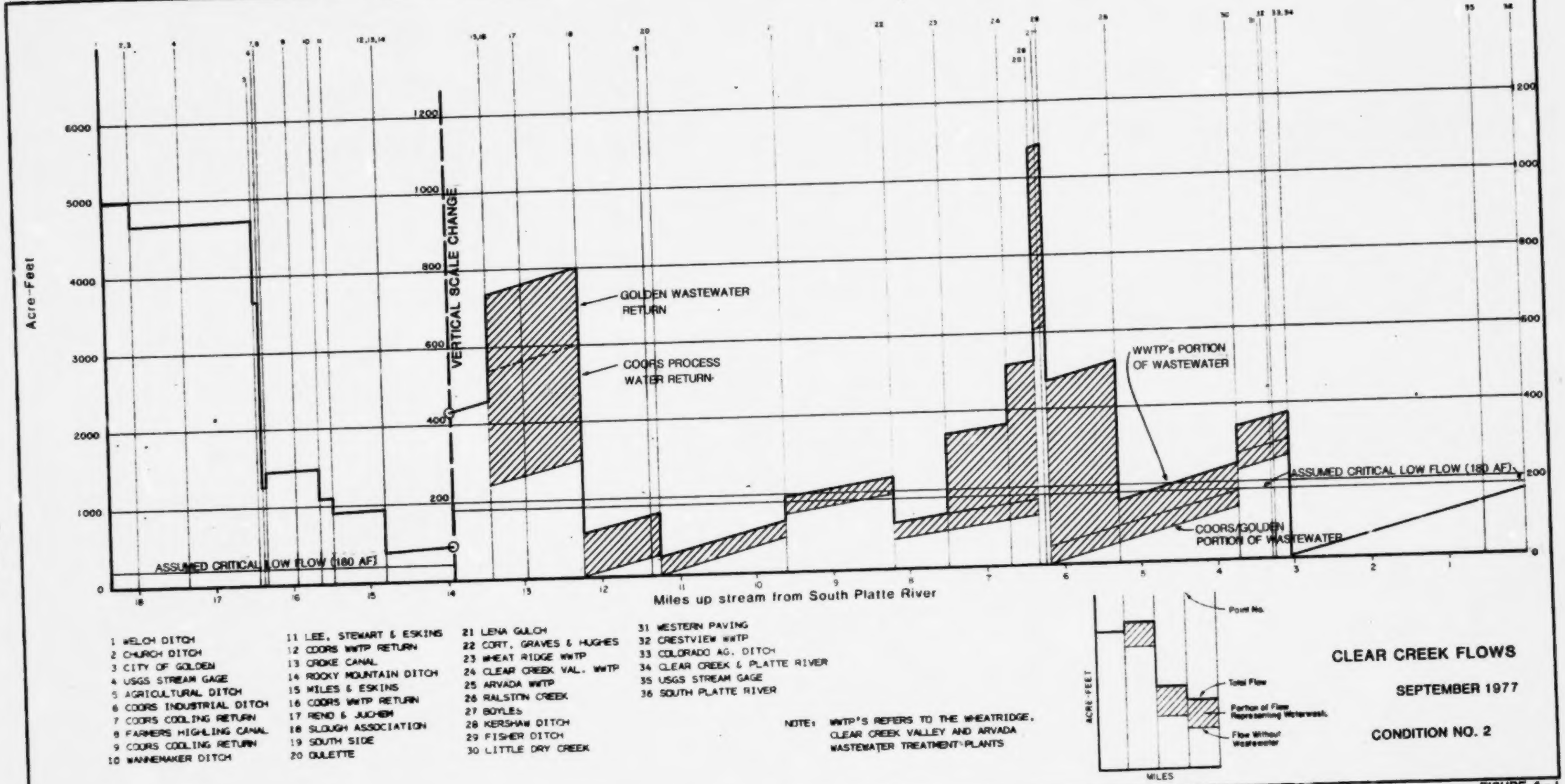
The impacts during the summer season are more complex than during the winter. The allocation of Clear Creek water is dependent on the water rights calls on the river, which vary on a daily basis during the irrigation season. To estimate the impacts for the non-runoff summer months, we have performed an analysis of the month of September, projecting the streamflow of 1977 to the year 2000 (see Figures 4-1 through 4-4).

Table 4-3 presents the estimated changes in streamflow from condition 1 (existing condition) that may occur for conditions 2 through 5. If the existing plants remain open, Clear Creek flows would be increased above the Clear Creek and Platte River Ditch due to the flow addition of Golden's wastewater. Under conditions 3 and 5, with the plants closed, there would be an increase in flows upstream of the plants, but a decrease in flows would occur between the plants and the Clear Creek and Platte River Ditch.

Impacts to diversion ditches associated with these changes in flows are based on the 1977 calls as discussed in Section 4-2; the Slough Association will absorb some but not all of the increased streamflows resulting from the Golden/Coors plant. The Fisher Ditch and the Clear Creek and Platte River Ditch will increase their diversions slightly if the WWTP's remain open. If, however, the plants close as in conditions 3 and 5, the amounts of water available to these two ditches will decrease. The effects of the various conditions on the affected ditches are presented in Table 4-4.

4.3.4 Runoff Season Streamflow

The month of May, a runoff month, was analyzed on a qualitative basis assuming that the pattern of calls in the year 2000 would be similar to those of 1977. Increases or decreases in streamflow associated with the project will accrue totally to the South Platte River during about 11 days of the month. Increases in flow during the total of 20 days the Clear Creek and Platte River Ditch and Colorado Agricultural Ditch (CAD) have their calls on the creek will accrue to these ditches, with a portion of the increase accruing to the South Platte River if the total needs of the CCPRD and CAD are exceeded by the increase. Decreases in streamflow during those same 20 days will accrue to upstream junior ditches.



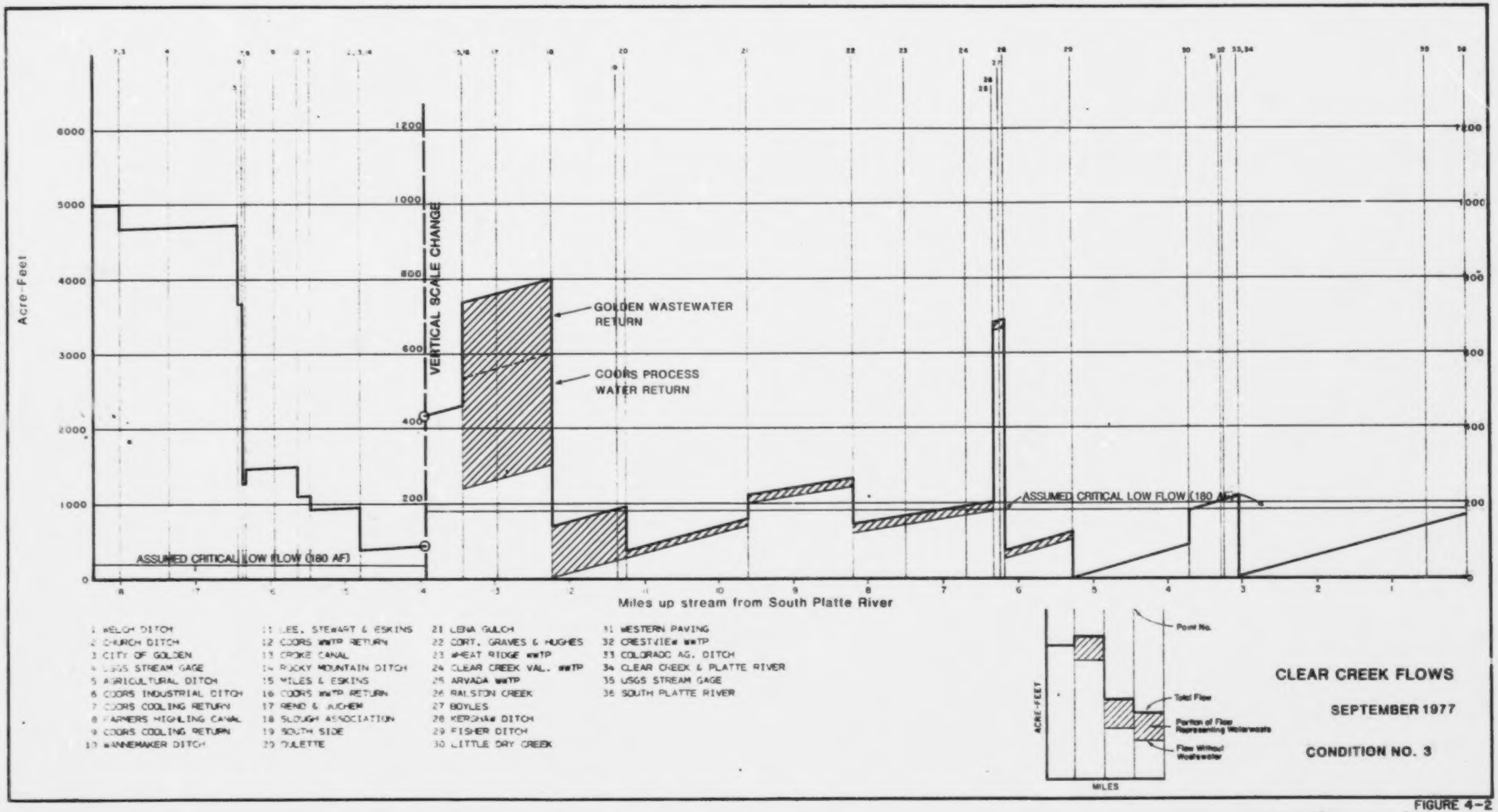
NOTE: WWTP'S REFERS TO THE WHEATRIDGE, CLEAR CREEK VALLEY AND ARVADA WASTEWATER TREATMENT PLANTS

CLEAR CREEK FLOWS

SEPTEMBER 1977

CONDITION NO. 2

FIGURE 4-1



CLEAR CREEK FLOWS

SEPTEMBER 1977

CONDITION NO. 3

FIGURE 4–2

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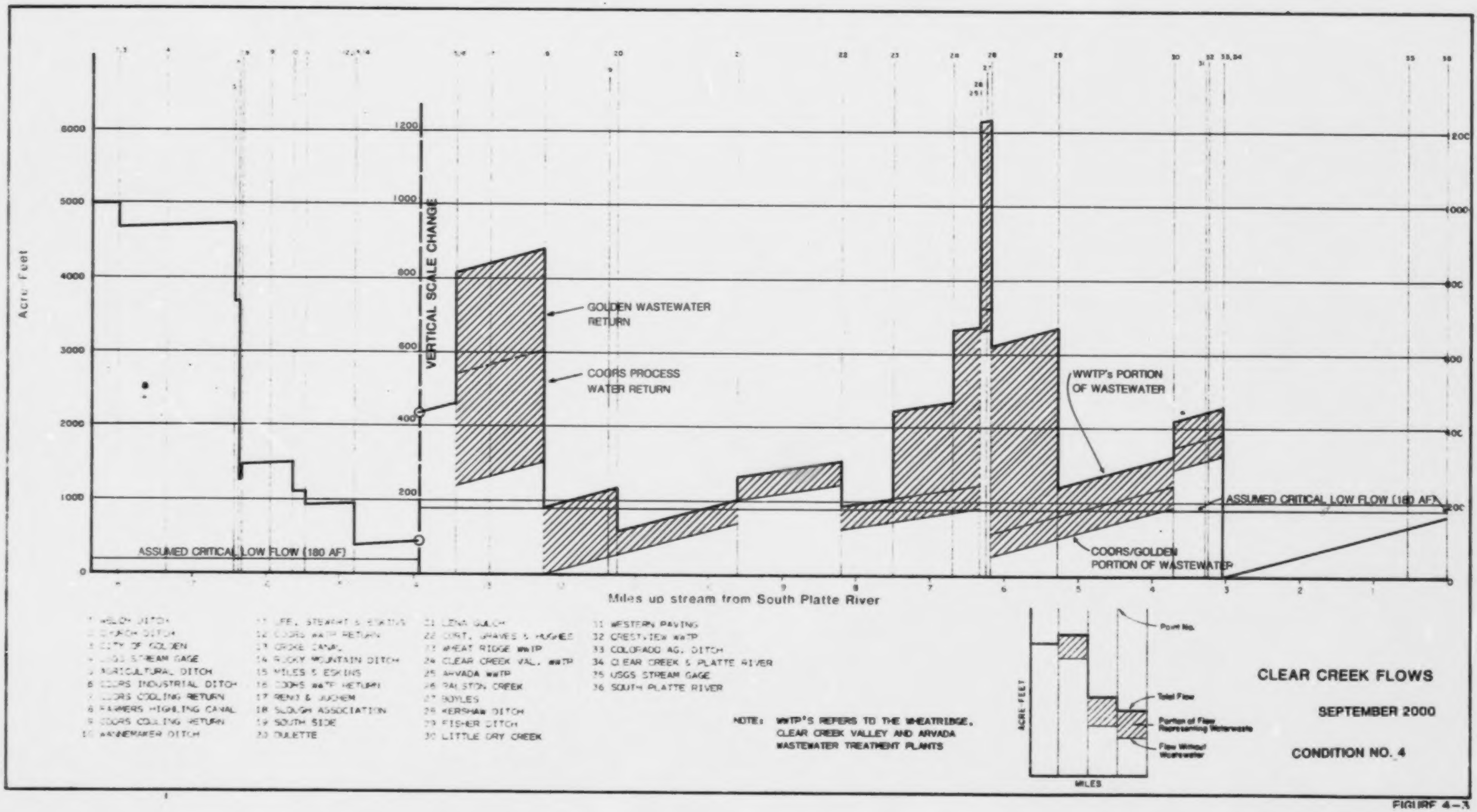
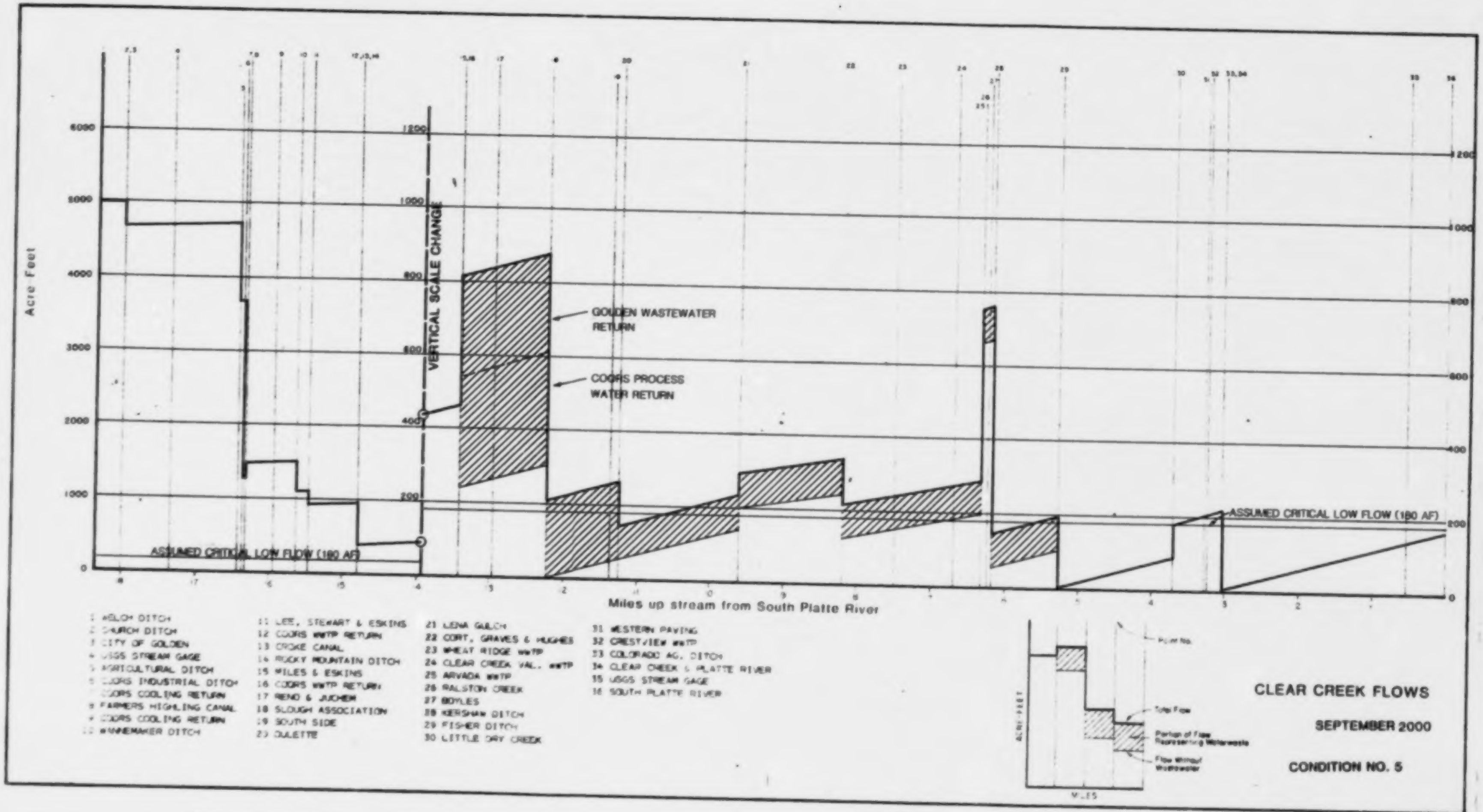


CLEAR CREEK FLOWS

SEPTEMBER 2000

CONDITION NO. 4

FIGURE 4-3



CLEAR CREEK FLOWS

SEPTEMBER 2000

CONDITION NO. 5

FIGURE 4-4

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TABLE 4-3

ESTIMATED CHANGES IN STREAM FLOW FROM EXISTING CONDITIONS

(For Month of September)

STREAM MILE	STREAM REACH	ACRE FEET/CFS CONDITION 2	CONDITION 3	CONDITION 4	CONDITION 5
13.42	Coors/Golden WWTP TO	197.8/3.32	197.8 / 3.32	275 /4.62	275 / 4.62
12.22	Slough Association TO	78.0/1.31	84.6 / 1.42	117.7/1.98	125.8 / 2.12
7.50	Wheat Ridge WWTP TO	78.0/1.31	(-119.4)/(-2.01)	148.1/2.49	(- 78.2)/(-1.32)
6.70	Clear Creek Val WWTP TO	78.0/1.31	(-266.5)/(-4.49)	194.2/3.27	(-225.3)/(-3.79)
6.33	Arvada WWTP TO	78.0/1.31	(-340.9)/(-5.74)	194.2/3.27	(-299.7)/(-5.05)
5.28	Fisher Ditch TO	0	(-162.0)/(-2.72)	76.5/1.28	(-162.0)/(-2,72)
3.03	Clear Creek & Platte R. D. TO	0	0	0	0
0	Platte River				

NOTE: Conditions upstream of stream mile 13.42 is assumed to remain approximately as present conditions.

TABLE 4-4

ESTIMATED CHANGE IN DIVERSIONS

FOR MONTH OF SEPTEMBER

DITCH	CONDITION 1	CONDITION 2		CONDITION 3		CONDITION 4		CONDITION 5	
	(Present)	Diversion	Change	Diversion	Change	Diversion	Change	Diversion	Change
Slough Association	534.6	654.4	119.8	647.8	113.2	691.9	157.3	683.8	+149.2
Fisher Ditch	316.8	394.8	78.0	137.9	-178.9	434.5	117.7	179.1	-137.7
Clear Creek and South Platte River Ditch	378.2	378.2	0	216.5	-161.7	454.7	+ 76.5	216.6	-161.6

NOTES:

1) All values shown are in acre feet

2) Changes indicated are from present condition (Condition 1)

3) All other diversions on the stream are considered to divert flows as in present conditions

During May it is unlikely that the level of flow would be below the critical low flow level of 3 cfs or 180 A-F per month. The flow level would vary in relation to the base conditions, but, even in a dry year, the flow would probably remain above about 900 A-F per month (15 cfs) throughout the length of Clear Creek.

4.4 WATER QUALITY IMPACTS

4.4.1 General Considerations

The recommended alternative described in Chapter 3, including abandonment of existing in-basin WWTP's, will result in diverse impacts on Clear Creek water quality. Several of these impacts are a result of urban development and land use changes rather than of the selected alternative. The interrelationships between land use, stream flow, aquatic habitat, and water quality provide numerous variables for consideration. The impacts of the alternative on water quality are discussed in light of these variables in the following sections.

4.4.2 Issues Not Specific to the Chosen Alternative

Certain impacts on water quality associated with this project are not specific to the chosen alternative. Impacts associated with land use, mine drainage, abandoned landfills, and DRCOG's 208 Non-Point Source Program fall within this category and are discussed below.

Land Use

Development of the Clear Creek Basin has been an accepted part of all previous studies. Conversion of vacant, grazing, or agricultural land to residential, commercial, or industrial uses results in changes in the degree and types of pollutants contributed by storm runoff. Land use changes have been examined in previous studies and in other sections of this report. Water quality impacts of these changes have been estimated in the DRCOG modeling studies performed as part of the Water Quality Management Program. Increases in ammonia, nitrate, phosphrous, fecal coliforms and total dissolved solids were anticipated.

As the urban area expands into vacant or agricultural land, natural drainage systems will be replaced by ditches (usually following roads) and storm sewers. As has occurred in the past, these storm drainage systems will concentrate the storm water discharge into Clear Creek or its tributaries. This man-made system may be significantly different from the natural drainage patterns both in flow sequence and discharge locations. Thus, not only will the land use changes affect the types and magnitude of pollutants discharged, but the locations of in-stream water quality impacts of urban runoff will be affected.

Mine Drainage

A major premise of the Clear Creek Facility Plan has been the presence of significant metals concentrations from upstream mine drainages (CH_2M Hill, 1977). Studies currently underway by the Colorado Mined Land Reclamation Board are expected to produce significant water quality improvements (Holm, 1980). Noteworthy projects under consideration include possible treatment and metals recovery from the Argo Mine drainage and the routing of North Clear Creek flow through Central City and Blackhawk to avoid mine tailings. It is believed that the completion of these two projects, which is anticipated within the next five years, will reduce the metals concentration in the upper main stem of Clear Creek to the point where a cold water fishery can be re-established. A reduction downstream in the study area is also anticipated.

However, it is also expected that additional mining will take place and existing mines will be reopened in the future (Holm, 1980). Historically, enforcement of discharge permit requirements for mining operations is reported to have been extremely lax. In addition, inactive mine operations are not required to comply with discharge standards and discharges from these mines occur uncontrolled. Thus, unless enforcement acivities are expanded to provide control of inactive mines and better monitoring of operating facilities, any upstream water quality improvements achieved in the next few years will probably be eclipsed by new discharges.

Landfills

The possibility of pollutant leaching from landfills has been studied at a site adjacent to Clear Creek in Adams County (Fox and Assoc., Inc., 1974). Results from the initial sampling, during the spring, summer, and fall of 1974, show minor pollutant leaching. Subsequent samples taken in 1976 and 1977 show increases in concentrations of calcium, magnesium, sodium, chloride, sulfate, ammonia, and free carbon dioxide. No measure of ground water flow through the site is available, but the methods of filling and compaction were expected to minimize this movement.

Given the large number of abandoned landfills adjacent to Clear Creek and concentrated between Sheridan Boulevard and Broadway, as shown in Figure 2-7, continued leaching of pollutants is likely. The long-term impact of these pollutants is difficult to quantify; however, a decrease in values with time is expected as the wastes stabilize. Furthermore, construction activities on the I-76 and Clear Creek Interceptor routes crossing this area may require removal of some of the old dumps.

Non-Point Source Program

In the 208 Water Quality Management Plan for the metro Denver area, DRCOG established the Non Point Source Program to reduce the magnitude of non-point source pollution in the area. Specific measures to be implemented at present are, for the most part, non-structural and funded only from existing governmental maintenance budgets. However, ongoing studies by DRCOG continue to explore the effectiveness and adequacy of non-point source controls, and ongoing control projects are planned to reduce pollutants from storm runoff.

4.4.3 Issues Specific To The Chosen Alternative

The timely full utilization of the proposed Clear Creek Interceptor is, in part, dependent upon the abandonment of facilities now operating in the basin. The continued operation of these plants is dependent upon the classification of Clear Creek by the state and the subsequent discharge standards imposed.

Water Quality Standards

The Colorado Water Quality Commission is considering adjusting the water quality standards for Clear Creek based on standards proposed by the Colorado Department of Health. These standards provide for a warm water fishery on Clear Creek below Golden and stringent requirements for protection of public water supplies.

The Adolph Coors Company has proposed an alternative set of standards which do not make provisions for a warm water fishery. The Coors standards are less stringent than the Colorado Department of Health standards and propose the division of Clear Creek segments at Wadsworth Boulevard rather than Youngfield Street. Differences in the two proposed standards are noted for ammonia, residual chlorine, cadmium, copper, lead, iron, manganese and zinc. These two sets of standards are presented in Tables 4-5 and 4-6. Other governmental units, such as the CDW, and interested parties have prepared alternative proposals to the Department of Health proposed standards, but not in the level of detail of standards prepared by Coors.

The standard selected will have a pronounced effect on water quality, since subsequent discharge permits will be based on these standards and on low flow values.

Low Flows

Section 4.3 discusses low flow values for Clear Creek, however it should be noted that original low flow estimates used in determining discharge standards were significantly higher than actual low flows. When coupled with the existing stream classification in the wasteload allocation, the resulting discharge requirements for a given discharger were high (Black and Veatch and DRCOG,, 1974). Thus existing discharge requirements would require revision to account for more realistic low

TABLE 4-5

Proposed Water Quality Standards
Colorado Department of Health
Clear Creek

Parameter[1]	Mainstream from Golden to Youngfield Street	Mainstream from Youngfield Street to So. Platte River
Dissolved Oxygen	5.0	5.0
pH	6.5-9.0	6.5-9.0
Fecal Coliforms, per 100ml	2000	2000
Ammonia (unionized)(NH_3)	0.10	0.06
Residual Chlorine(Cl_2)	0.003	0.003
Cyanide (free)	0.005	0.005
Sulfur(as H_2S undis.)	0.002	0.002
Sulfate (SO_4)	250.0	-
Boron	0.75	0.75
Nitrite (NO_2)	0.5	0.5
Nitrate (NO_3)	10.0	-
Chloride (Cl)	250.0	-
Arsenic (As)	0.05	0.05
Cadmium (Cd)	0.001	0.001
Chromium (tri)	0.05	0.05
Chromium (hex)	0.025	0.025
Copper (Cu)	0.024	0.024
Lead (Pb)	0.025	0.025
Iron (Fe,sol.)	0.3	0
Iron (Fe,tot.)	1.2	1.2
Manganese (Mn,sol.)	0.05	-
Manganese (Mn,tot.)	1.2	1.2
Mercury (Hg)	0.00005	0.00005
Nickel (Ni)	0.1	0.1
Selenium (Se)	0.01	0.01
Silver (Ag)	0.0001	0.0001
Zinc (Zn)	0.150	0.150

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[1] All parameters expressed in mg/l unless noted otherwise

TABLE 4-6

Proposed Water Quality Standards
Adolph Coors Company
Clear Creek

Parameter[1]	Mainstream from Golden to Wadsworth Boulevard	Mainstream from Wadsworth Boulevard to So. Platte River
Dissolved Oxygen	5.0	5.0
pH	6.5-9.0	6.5-9.0
Fecal Coliforms, per 100ml	2000	2000
Ammonia (unionized)(NH_3)	0.28	1.12
Residual Chlorine (Cl_2)	0.31	0.003
Cyanide (free)	0.005	0.005
Sulfur (as H_2S, undis.)	0.002	0.002
Sulfate (SO_4)	250.0	-
Boron	0.75	0.75
Nitrite (NO_2)	0.5	0.5
Nitrate (NO_3)	10.0	-
Chloride (Cl)	250.0	-
Arsenic (As)	0.05	0.05
Cadmium (Cd)	0.003	0.003
Chromium (tri)	0.05	0.05
Chromium (hex)	0.025	0.032
Copper (Cu)	0.14	0.16
Lead (Pb)	0.12	0.05
Iron (Fe, sol.)	0.3	-
Iron (Fe, tot.)	3.5	2.6
Manganese (Mn, sol.)	0.05	-
Manganese (Mn, tot.)	1.4	2.5
Mercury (Hg)	0.00005	0.00005
Nickel (Ni)	0.1	0.1
Selenium (Se)	0.05	0.01
Silver (Ag)	0.0001	0.0001
Zinc (Zn)	0.90	0.70

[1] All parameters expressed in mg/l unless noted otherwise

flow values shown in Section 2.3 and 4.3. Similarly, future discharge requirements will probably be more stringent not only due to the stream classification but due to the revised low flow values.

Water Quality Impacts

Since specific discharge standards are based on a given low flow and the stream water quality classification, it follows that less stringent water quality standards will result in less stringent discharge requirements.

The selected alternative calls for the abandonment of the three existing treatment plants discharging to Clear Creek. Stricter standards will accelerate this abandonment, and less strict standards may postpone it. In-stream water quality will be improved by the abandonment of these plants, however stream flow in the reach below each plant may be seriously reduced. The stricter standards would therefore hasten the water quality improvement and flow depletion.

In turn, the abandonment of these plants will result in a higher percentage of flow being contributed from non-point sources. The effect on in-stream water quality will be a function of the relative quality of the upstream flows and the non-point flows. Implementation of non-point source controls will reduce this influence an as yet undetermined amount.

The year 2000 critical low flow condition, described in Section 4.3, will extend from Croke Canal to Ralston Creek in the winter and from the Slough Association Ditch (Youngfield Street) to the South Platte River in the fall if the existing in-basin WWTP's close. The non-point source contributions, expected to be concentrated below Kipling Street, coincide with these critical low flow areas. Thus, during these low flow periods, the water quality in Clear Creek below Kipling should approximate the quality of water from the non-point sources, notably urban runoff and groundwater seepage.

From April to October, discharges from the Coors process wastewater treatment plant and the Golden/Coors wastewater plant will provide a significant portion of the flow in Clear Creek down to the Slough Association diversion. Due to the addition of the domestic wastewater effluent, nitrogen and phosphous concentrations will be increased in this segment. The impact of these nutrients on stream quality will be a function of the discharge standards, as discussed above.

4.5 AQUATIC/FISHERIES

4.5.1 Possible Areas of Habitat Loss - Short/Long Term

The initial impact to Clear Creek resulting from construction activities associated with the expansion of the sewage interceptor includes disturbing the benthic and riparian zones of the stream. The points along Clear Creek where the proposed interceptor will either intersect or approach the stream include the following: (1) 300 feet east of Parfet Street, (2) 200 feet west of Garland Street, and (3) 200 feet west of Pecos. The interceptor will also intersect Ralston Creek approximately 400 feet upstream from the Clear Creek confluence.

Actual construction will probably increase the suspended solids downstream and, as a result, increase sedimentation. Long-term impacts should be minimal providing stream banks are properly stabilized (i.e., revegetated and/or riprapped) immediately after construction activities cease. This would minimize future erosion and sediment problems.

Little or no direct fish mortality is expected. Ritchie (1972) found that physical damage to fish in waters with high suspended solids is limited because fish are able to withstand high turbidities for short periods. However, benthic macroinvertebrate populations may be altered slightly due to the increased sedimentation downstream. Construction activities may inhibit populations of these invertebrates at and immediately below each site, but recolonization should occur shortly after construction. Barton (1977) found that invertebrates had quickly recolonized a new riffle area which was previously denuded and removed during the construction of a highway culvert. Barton et al (1972) found that invertebrates completely recolonized a denuded stream bottom six months after highway construction activity in Utah. Based on the above findings, any construction-related impacts, from the installation of an additional interceptor pipe paralleling Clear Creek, are expected to be short term and of very little consequence to the existing aquatic life.

4.5.2 Future Importance of the Fishery

Until 1978, Clear Creek, below Golden, was not seriously considered as a source for fishing recreation. In the past few years, as transportation costs drastically increased, the Colorado Division of Wildlife began scrutinizing this section of Clear Creek for its potential as a municipal fishery. Along with maintaining the present population status of the various species, the Colorado Division of Wildlife is involved with the establishement of a Channel Catfish population throughout lower Clear Creek (Woodling, 1980). Channel Catfish have been widely accepted as a game fish throughout the central and southern United States, and more recently have gained popularity among some avid cold-water anglers further west. The Channel Catfish tolerates turbid water and, being an omnivore, appears to be well suited for lower Clear Creek habitation. An additional future consideration for fishery potential includes the advocation, by the Division of Wildlife, of the Creek Chub as an acceptable panfish. The Creek Chub is well adapted to streams and is largely carnivorous, feeding on a wide variety of organisms including insects, crustaceans, and small fish (Baxter and Simon, 1970).

4.5.3 Impacts Resulting From Specific Alternatives

Segment 1 - Golden to Youngfield Street

Critical low flows in the year 2000 will remain extended from the Croke Canal diversion to Youngfield Street in Segment 1 during the winter. The year 2000 flows will increase slightly from the Golden/Coors

WWTP effluent to Youngfield Street during the runoff through late irrigation seasons (April through October). This increase will provide additional habitable space for fish and possibly allow the water's edge to approach adjacent riparian vegetation throughout a greater portion of the year. However the excessive stream channelization will remain a major limiting factor in the perpetuation of a fishery throughout Segment 1.

Residual chlorine, BOD, phosphorous, and ammonia concentrations within Clear Creek may increase during the fall due to the Golden/Coors WWTP depending on the establishment of the various proposed water quality standards. Since few fish have been collected in this section of Clear Creek it is assumed that the establishment of either set of standards will not have a dramatic affect on the fishery during the fall and virtually no affect during the winter, when the Golden/Coors WWTP discharge is rerouted to the Croke Canal. Therefore the major factors which are presently limiting the fishery in this section, which include fluctuating flows, the lack of in-stream and riparian habitat, will also be limiting in the year 2000.

Segment 2 - Youngfield Street to Wheat Ridge WWTP

The increase in September flows, described in Table 4-3 of section 4.3, that will be realized throughout Segment 2 due to the project will apply generally to the non-winter months and will provide additional potential for the existing fishery. The increased flows will also benefit Clear Creek by purging excessive nutrients accumulated throughout the summer from pools and preventing possible eutrophication which would result in organic decay and dissolved oxygen depletions. Critical low flows will, however, remain throughout the segment during the winter. If snow cover and an ice cap persists on the stream and nutrients accumulated throughout the summer remain in the stream during the winter, low flows may further stimulate eutrophication by not supplying aerated water to the pools.

Generally warm water species are capable of tolerating lower dissolved oxygen concentrations, which may be experienced throughout this segment during the winter. The Channel Catfish (Ictarurus punctatus), which has been introduced to Segment 2 by the Colorado Division of Wildlife, may be adversely affected by these future winter conditions, as it is one of the first warm water species to be stressed by lower dissolved oxygen concentrations. Future investigations should be conducted to determine the actual reduction, if any, in concentrations of dissolved oxygen during the winter, as present winter flows in Segment 2 are expected to approximate the projected future flows.

As noted in Section 4.4 the water quality of Clear Creek below Kipling Street, during the periods of low flow, will approximate the quality of water from non-point sources. The non-point source components which would indirectly affect the fishery, if excessive loadings are introduced, are phosphorous and nitrogen, which can stimulate the growth of algae and other forms of aquatic life. This profuse growth would result in an over abundance of these organisms which, through growth and decomposition, would produce objectionable odors and deplete dissolved oxygen supplies, especially during low flows.

During the fall, water quality in Segment 2 will probably depend on the standards eventually adopted. The water quality standards proposed by the Adolph Coors Company for ammonia and residual chlorine, if equalled or exceeded instream, could become hazardous to the warm water fishery of Segment 2. The Colorado Department of Health, in proposing their standards, have taken into consideration warm water fisheries preservation and if equalled should not be injurious to the fishery. The Colorado Division of Wildlife has recommended general limitations for the preservation of aquatic life which are more stringent than the standards proposed by Coors and CDH. The CDW's reasoning behind the stringency is based on the fact that many specific toxicants are generally in solution together and will act additively in their mode of toxicity (Davies and Goettl, 1976). The possible high concentrations of iron and copper should remain at their existing levels during the winter because the present flows are similar to those projected for the year 2000. During the fall iron and copper concentrations may be reduced, based on the projected increased flows provided by the Golden/Coors WWTP.

Segment 3 - Wheat Ridge WWTP to South Platte River

Provided existing WWTPs remain in operation, Segment 3 would realize a slight increase in flow from the Wheat Ridge WWTP to the Clear Creek and Platte River Ditch diversion, as discussed in Section 4.3, during the late irrigation and runoff seasons. These flow inundations would slightly increase the habitable space that is presently wanting due to restricted flows. Positive effects would be more noticeable in the upper part of this segment. In the case of WWTP abandonment, decreases in flow would be realized from the Wheat Ridge WWTP to the Clear Creek and Platte River diversion, further inhibiting the fishery through increased areas of water stagnation which could result in decreased concentrations of dissolved oxygen.

Coors has proposed ammonia concentrations which, if equalled or exceeded, may be harmful to the existing fishery. The CDH proposed standards for Segment 3 are equivalent to those proposed for Segment 2. With the abandonment of the WWTPs, the concentrations of unionized ammonia and residual chlorine are expected to sharply decrease resulting in the enhancement of Segment 3 for fishery habitat. However, the large reduction in flows, resulting from the abandonment of the WWTPs and the proportional increase in non-point source contributions, discussed earlier, will render Segment 3 of Clear Creek potentially uninhabitable for most warm water fish.

4.6 AGRICULTURAL LANDS

4.6.1 Summary of Impacts

As noted in Section 4.2 and Table 4-1, effects of the proposed project on irrigation ditch flows would be confined to the Slough Association, the Fisher Ditch, the Clear Creek and Platte River Ditch, and the Colorado Agricultural Ditch. This discussion focuses on the affected ditches, considering type of croplands served and land use planning considerations relevant to ditch service areas.

Although flow and ditch diversion impact projections presented in Sections 4.2 and 4.3 were done for May and September, the impacts in August and October are likely to be similar to those described for September, and impacts for June can be expected to resemble those described for May. During September, under Conditions 2 and 4 (treatment plants in operation), all affected ditches receive increased flows relative to baseline flows. Under Conditions 3 and 5 (treatment plants closed), the Slough Association ditches receive a 21-28 percent increased flow. Negative flows accrue to the Fisher Ditch (43 percent in the year 2000 and 56 percent under present conditions), the Clear Creek and Platte River Ditch (43 percent reduction from current flows under both the current and year 2000 conditions), and the Colorado Agricultural Ditch (no projections made, but the magnitude of loss would probably be similar to that of the Clear Creek and Platte River Ditch).

During the May period, no impact or a positive flow effect is projected under Conditions 2 and 4 for all affected ditches. Under Conditions 3 and 5, however, the Colorado Agricultural and Clear Creek and Platte River Ditches receive reduced flows. Thus, the most significant flow reductions are expected to accrue to the Clear Creek and Platte River Ditch and the Colorado Agricultural Ditch.

4.6.2 Slough Association

The Slough Association consists of 20 different ditches. Detailed information on the ditches could not be obtained because many of the ditch operators or share owners do not retain data on their ownership (Rock, 1980). To determine a service area for the Slough Association, it was assumed that all lands between Ralston Creek, Swadley Ditch, and Clear Creek are served by the Association ditches.

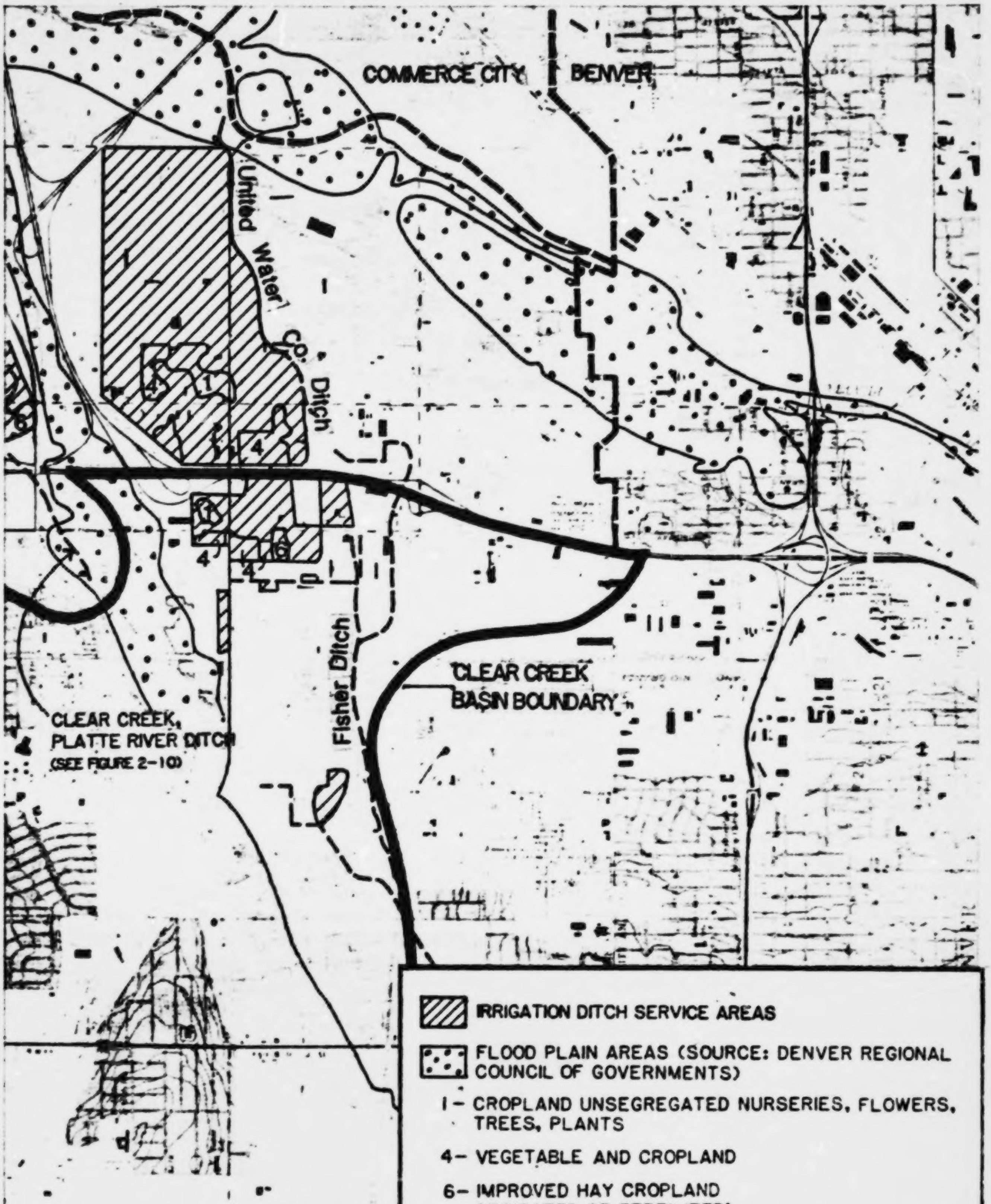
The principal agricultural land uses in the Slough Association service area are truck gardening, pasture, and hay cultivation on small parcels. It is unclear to what extent the owners of these agricultural parcels would benefit from the projected increased flows accruing to the Slough Association ditches due to implementation of the proposed project.

Within the Slough Association service area, which is located in the City of Wheat Ridge, twenty-six agricultural parcels, totalling about 140 acres, were identified. There are, however, a large number of parcels not inventoried due to their very small size. Only three of the inventoried parcels are located in areas planned for conservation or open space in the City of Wheat Ridge Comprehensive Plan (no date). Most of the remaining parcels are expected to undergo urbanization in the forseeable future, with the smaller parcels most likely to remain in "pleasure farming" uses. Given the expectation that many parcels will urbanize, the beneficial impacts of increased ditch flows, if any, would be temporary.

4.6.3 Fisher Ditch

Fisher Ditch services lands in the eastern portion of the Clear Creek Basin, and many of its shares are owned by United Water Company, which services lands located to the east of the Clear Creek Basin boundary (Figure 4-5). These two ditches service small parcels of land, totalling approximately 68 acres, devoted primarily to truck gardening, but much of the water is used for municipal and industrial purposes (Firole, 1980).

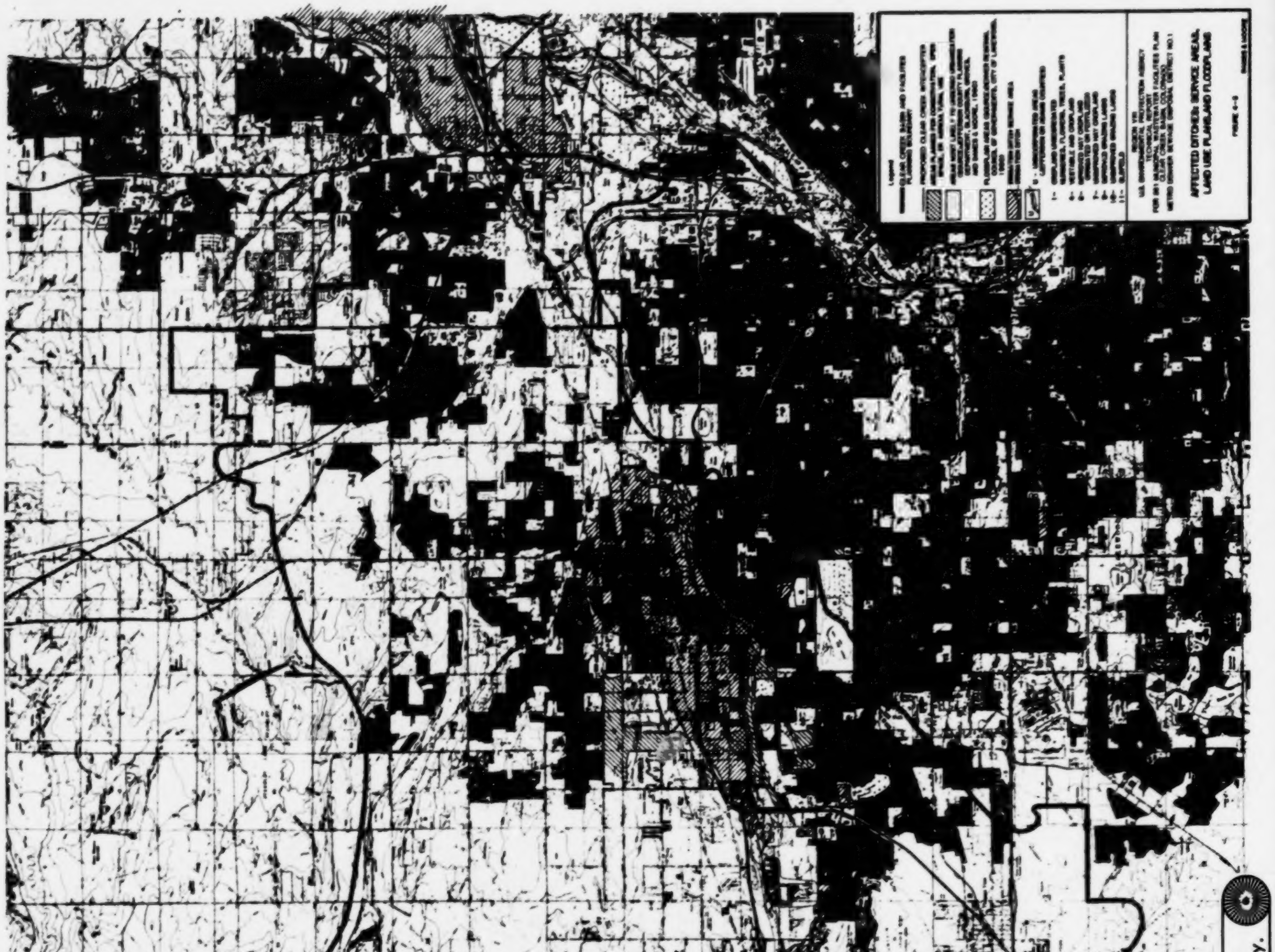
The service areas of the Fisher and United Water Company Ditches are located within unincorporated Adams County. While the Adams County Land Use Plan (1975) designates this area for urban development, the plan is not site-specific. However, development pressures in the area are high, and since none of the agricultural parcels are located in a floodplain (Figure 4-5), it can be expected that most would undergo development in the forseeable future even in the absence of the proposed interceptor project. Thus, the impact of reduction in ditch flows on agriculture in the area (conditions 3 and 5) is assessed as slight. It


COMMERCE CITY
DENVER
United Water Co. Ditch
Fisher Ditch
CLEAR CREEK BASIN BOUNDARY
CLEAR CREEK, PLATTE RIVER DITCH (SEE FIGURE 2-10)
1
4
6
N
▨ IRRIGATION DITCH SERVICE AREAS
FLOOD PLAIN AREAS (SOURCE: DENVER REGIONAL COUNCIL OF GOVERNMENTS)
1- CROPLAND UNSEGREGATED NURSERIES, FLOWERS, TREES, PLANTS
4- VEGETABLE AND CROPLAND
6- IMPROVED HAY CROPLAND (IRRIGATED OR FERTILIZED)

AFFECTED AGRICULTURAL LANDS
FISHER DITCH SERVICE AREA

DAMES & MOORE

FIGURE 4-5



Legend
REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL REPORT
FOR 201 WASTEWATER FACILITIES PLAN
CLEAR CREEK BASIN, COLORADO
METRO DENVER SEWAGE DISPOSAL DISTRICT NO. 1
AFFECTED DITCHES: SERVICE AREA,
LAND USE PLAN, AND FLOODPLAIN

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is uncertain whether the increased flow impacts (conditions 2 and 4) would result in increased agricultural productivity in the Fisher Ditch service area because flows have historically been adequate for farming (Firole, 1980). However, the United Water Company ditch has recently experienced dryness in August (Gaccetta, 1980) and increased flow into Fisher Ditch may therefore increase agricultural productivity in the United Water Company service area.

4.6.4 Clear Creek and Platte River Ditch (CCPRD)

About 40 percent of the water from the CCPRD is used by Northglenn, Thornton, and Adams County, with the remainder used for irrigation of truck gardens at the upper end of the ditch, and corn, wheat, hay, small grains, and vegetables at the lower end (Fukaye, 1980). Total agricultural acreage is about 3,046. The entire service area is located east of the Clear Creek basin, as shown in Figure 2-10. Lands within the CCPRD service area are very fertile (Perea, 1980); some are Prime Agricultural Lands (Denver Regional Council of Governments, 1977b).

Most of the agricultural lands are located in floodplains or in lands zoned for mineral conservation. Some of those lands not in floodplains are designated for urban development in the Adams County Comprehensive Land Use Plan but are owned by families who have farmed them for years and are unlikely to sell to developers (Perea, 1980). Thus, it can be expected that a large proportion of the agricultural lands serviced by the CCPRD would remain in production in the absence of the proposed project.

Under Conditions 2 and 4, no decrease in CCPRD flows is expected (see Section 4.2). The projected decrease in flows under Conditions 3 and 5, however, is substantial, and a commensurate decrease in agricultural productivity for CCPRD lands can be expected. This adverse impact would occur in both the spring and August-October periods. Given the productivity of agricultural lands serviced by CCPRD and the magnitude of the projected water loss arising due to project implementation, adverse impacts are considered to be substantial.

4.6.5 Colorado Agricultural Ditch

The service area of the Colorado Agricultural Ditch overlaps with that of the CCPRD. Many of the lands within the CCPRD and Colorado Agricultural Ditch service areas use both sources for irrigation (Figure 2-10). Therefore, the same impacts described above for the CCPRD can be expected for the Colorado Agricultural Ditch service area.

4.7 POTABLE WATER SUPPLIES

In addition to the impacts on agricultural lands along lower Clear Creek ditches, the project will impact potable water supplies identified in Table 2-3 and Section 2-7. Northglenn and Thornton water supply diversion in CCPRD, Colorado Agricultural and Fisher Ditches will be augmented if the in-basin WWTP's remain open (Conditions 2 and 4). However, if the in-basin plants close (Conditions 3 and 5), these potable supplies will be significantly depleted from present levels of Clear Creek use. As noted in previous sections, Thornton and Northglenn have already begun phasing out use of these lower basin diversions, so that the loss of streamflow in the lower reach may not affect them in the future. However, closure of the in-basin plants will probably improve dry weather water quality in the depleted lower basin ditch diversions, which would be a benefit to the Thornton and Northglenn water systems.

The latter comment holds true for Crestview W&SD diversions through Kershaw Ditch. Moreover, Crestview will not be injured by flow depletions in Conditions 3 and 5, so the net impact will be beneficial to Crestview. Crestview would be unaffected in Conditions 2 and 4. Other municipal diversions for potable use are made above the reach of Clear Creek affected by the project.

Impacts on individual potable supply wells or Coors process supply wells in the basin will depend on the degree of contact and translation of surface water quantity and quality into the alluvial aquifer. This phenomenon varies from place to place depending on aquifer thickness and composition and the hydrological relationships between well locations and the creek. Impacts cannot be determined on the basis of these studies.

4.8 RECREATION

Implementation of the proposed interceptor plan would create opportunities for recreational uses of the right-of-way. The recreational opportunities afforded by the proposed project would consist of a bikeway route, hiking trail, or horse trail, with a horse trail being most likely. However, the presence of the existing Clear Creek bike route could be an impediment to the chances for federal or state funding for trail installation.

The proposed interceptor route generally follows, but does not coincide with, the Clear Creek trail designated in the Denver Regional Council of Governments' Regional Growth and Development Plan. It is unclear whether or not the agencies that would be involved in the A-95 review process would support the concept of a parallel trail, nor is there evidence that local jurisdictions would be willing to provide funds, even on a federal matching basis, for such a trail.

MDSDD was created under Colorado's Metropolitan Districts Act of 1961, which enabled organization of sewer service agencies in multijurisdictional areas. The potential for agencies created under the Act to be involved in recreation planning was not addressed in the legislation, nor have legal opinions been formally rendered. MDSDD has been involved in some recreational planning activity through contacts with local government agencies, but the opinion of its legal staff and Board of Directors is that while some involvement in cooperative recreation facility planning with local governments is appropriate, significant expenditures for recreational use of MDSDD facilities are not within the scope of MDSDD's legal functions. While MDSDD may be willing to submit grant applications for recreational investments (such as those covered by Section 201 of the Clean Water Act), as well as supervise construction, the local matching share for any significant expenditures would have to be provided by local jurisdictions. However, to date no jurisdiction in the Clear Creek Basin has communicated an interest in funding a recreational trail along the proposed interceptor right-of-way to MDSDD (Van Royen, 1980).

Comments obtained from local jurisdictions regarding recreational use of the proposed interceptor right-of-way are included in Appendix A. While no written comments were received from the City of Wheat Ridge, Mr. Rich Bredt, Director of Parks and Recreation for the city, communicated (1980) the city's desire that any damage to the city greenbelt and Clear Creek trail caused by construction be repaired. Mr. Bredt also stated that the potential for a horse trail should be examined, but that such a trail would probably be feasible only for the area west of Kipling Avenue due to road crossing constraints. Written comments from other jurisdictions generally support the use of the interceptor right-of-way for a trail.

The primary opportunity for recreational use of the proposed interceptor right-of-way appears to be for a horse trail, due to the existence of a hiking trail and bikeways in the corridor. As noted earlier, such a trail would be most feasible between Youngfield and Kipling, an area within the jurisdiction of the City of Wheat Ridge. The implementation process involved, were the city to be interested in a horse trail, would require cooperation between MDSDD and the city, with MDSDD making application for EPA Section 201 funding for design and construction funds (except for topcoating, which is not an allowable expense under Section 201), and the City of Wheat Ridge performing most of the design work and providing the local 25 percent matching share. Funding for topcoating the trail could come from the city's general funds, Jefferson County Open Space sales tax revenues, the State Parks and Outdoor Recreation Division (if funds become available), or the Heritage Conservation Society. Successful implementation of a horse trail would, however, hinge on cooperation between MDSDD and the City of Wheat Ridge.

5.0 MITIGATION MEASURES

5.1 OBJECTIVES

Section 4.0 has shown that the proposed project will have significant impacts on water rights and agricultural lands associated with ditch diversions along lower Clear Creek. Also, the project will have mixed and as yet non-quantifiable impacts on water quality and aquatic habitat; these impacts will vary depending on water quality standards and discharge requirements and the determination of required minimum flows for summer and winter conditions on Clear Creek. The overall objectives of the mitigation measures implemented will be to balance needs of the Clear Creek Basin for improved wastewater treatment facilities provided by the project with maintenance and enhancement, where feasible, of the complex set of human environmental factors in existence in the basin. These objectives are summarized as follows:

a. Improvement of aquatic life and recreation potential on Clear Creek by having sufficient minimum flows and water quality in improvable reaches;
b. Meeting water supply needs of basin communities;
c. Meeting water rights requirements;
d. Providing necessary wastewater treatment; and
e. Protecting agricultural lands serviced by Clear Creek water where it is reasonable to do so.

5.2 STRATEGIES

Mitigation measures indicated by the analyses, observations, and studies reported herein relate a) directly to the effects of the proposed Clear Creek Interceptor project on streamflow and b) more generally to enhancement of the Clear Creek Basin environment, especially recreation and water quality.

Mitigation of Streamflow Depletions

1. Augment In-Basin Treatment. Revise the MDSDD service area to allow additional municipalities such as North Table Mountain, Pleasant View, Applewood, Fruitdale, Northwest Lakewood, and Westridge to have their wastewaters treated at the planned Golden/Coors municipal WWTP (existing process WWTP). This would essentially involve "re-inventing"

the 40th and Youngfield satellite plant alternatives considered in facilities planning. However, differences would be plant ownership and operation (Coors), discharge point upstream at McIntyre (or Croke Canal in winter, based on existing Coors operating procedures), and raw wastewater transportation requirements and costs (plant is 3.4 miles upstream from 40th and Youngfield). Assuming the existing in-basin plants close by 1985 and flows just prior to closure are the same as the existing situation totaling 4.47 MGD, an additional flow to the Golden/Coors plant of 1.97 MGD would be required to make up the loss of flow. This assumes Golden/Coors flow in 1985 is 2.73 MGD (McNeill, 1980b). This make up flow could be provided by routing North Table Mountain and Applewood wastewaters to the Golden/Coors plant.

If it is assumed that the year 2000 deficit of 2.45 MGD (existing in-basin plants at year 2000 flows (Table 4-2) - 5.45 MGD-minus Golden/Coors year 2000-3.0 MGD) must be made up, then wastewaters from North Table Mountain and Pleasant View could be routed to Golden/Coors. It is interesting to note that these "satellite" service areas closely resemble that of Alternative No. 2 in the Clear Creek Facility Plan (CH_2M Hill, 1977) with the deletion of Pleasant View or Applewood, both of which were included in Alternative No. 2. Indications are that the Golden/Coors plant (existing) has sufficient capacity for these increased flows.

2. Pump Back Effluent. Pump sewage effluent from the MDSDD Central Plant to provide augmentation of headgate diversons for ditches on lower Clear Creek up through the Fisher Ditch which are impacted by the proposed MDSDD interceptor. Alternatively, effluent could be pumped directly to the irrigated lands or major industrial or municipal users. Cost, engineering, and health factors would dictate the most feasible arrangement. Pumping distance from the MDSDD Central Plant to the Fisher Ditch would be about five miles. Also, effluent could be pumped to a point higher in the basin (say, Youngfield Street) to augment streamflow in the most desirable segment for aquatic life (Youngfield to Wadsworth)

as well as providing additional supplies for diversions at ditches on lower Clear Creek. The effluent supplied would have to come from the fraction of Central Plant flows originating as potable water supplies in the South Platte River Basin, since the Blue River Decree limits Denver Water Board use of Blue River trans-mountain water supplies to "municipal purposes" (Bishop, 1980).

3. Revision of Standards. Closure of the existing in-basin WWTP's could possibly be averted by changing the in-stream classification of Clear Creek below the Wheat Ridge WWTP discharge to reflect no aquatic life uses. This would allow the plants to function at essentially their existing levels of treatment. Alternatively, the existing standards can be tightened, as is now being considered by the Colorado Water Quality Control Commission, to assure that discharges from remaining in-basin plants such as Golden/Coors, do not degrade water quality. This will nearly assure closure of the existing in-basin plants and increase the influence of non-point pollution sources.

4. Purchase In-Stream Flow Rights. Colorado Water Law has been revised to allow the purchase of water rights for maintenance of in-stream uses such as aquatic habitat. A consortium of local governments and the Colorado Division of Wildlife benefiting from habitat maintenance could be formed to fund such a program. Such rights could be obtained for the segment of Clear Creek above the lower end ditches, so that the reserved water would become available for their diversions.

5. Transfer Points of Diversion. In recent years Thornton has begun phasing out diversions for water supply at lower Clear Creek ditches (Lower Clear Creek and Platte River, Colorado Agricultural, and Fisher Ditches) because of poor water quality. Thornton plans to make increasing use of Standley Lake and diversions higher in the basin (Church, Farmers Highline, and Croke Canals) for future supplies. In-stream flow maintenance, described above in item 4, could be further enhanced if they maintained a portion of their water supply diversions at the lower Clear Creek Ditches. More stringent standards, enforcement of

permits and closure of existing in-basin WWTP's would help produce adequate raw water quality.

Mitigation of Basin Water Quality Problems

1. Mine Drainage. Water quality in the Clear Creek Basin will be enhanced by implementation of reclamation plans for the Argo Tunnel and North Clear Creek now under study by the Colorado Mined Land Reclamation Board. High Copper and Zinc concentrations in the most favorable aquatic habitat segment from Youngfield to Wadsworth could be avoided. CDH and EPA enforcement of permits and standards for mining operations could be stepped up to avoid recurring problems. Also, enforcement authority over inactive mines should be reviewed to see that the maximum effort possible is expended within Colorado and Federal laws to control future pollution problems associated with expected increases in mining activities.

2. Sanitary Landfills. New standards in place provide adequate siting criteria for new landfills. Additional studies should be undertaken to monitor and inventory closed landfills and determine which are causing pollution problems in Clear Creek. Landfills should be relocated where feasible; or, controls such as leachate collection and treatment or ground water regime modification should be implemented.

3. Urban Runoff Control. The increasing influence of non-point sources, particularly urban runoff, must be checked to assure improved Clear Creek Water quality. Studies underway and continuing by DRCOG with the U.S. Geological Survey should be tied together for the Clear Creek Basin in a master plan. Elements would possibly include a) institutionalized "best management practices", b) design standards for new development, including catchment basins for sediment control, c) control of existing sub-basin discharges at critical points, and d) enforcement. Centralized control and enforcement may have to be considered to provide effective application of requirements.

4. Review Permit Basis. These studies have shown much lower Clear Creek flows at the points of discharge for existing in-basin plants

than the 7Q10 of 42.7 cfs apparently used by DRCOG in preparing the 1974 wasteload allocation used as the basis for NPDES permits issued in the basin. Flow data developed herein should be reviewed and the low flow for permit issuance reconsidered, so that real impacts of wastewater discharges on Clear Creek can be reduced in the future.

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APPENDIX A

city of arvada
8101 RALSTON ROAD
ARVADA, COLORADO 80002
PHONE 303-421-2550

September 9, 1980

Mr. David Clark
Mr. Paul Pigeon
Dames & Moore
1626 Cole Blvd.
Golden, Colorado 80401

Dear Mr. Clark and Mr. Pigeon:

We are in receipt of the plans for the Clear Creek Interceptor. We find the plans for this interceptor in compliance with our Comprehensive Plan, and would hope that the developmenmt of the facility will be forthcoming in the very near future.

Sincerely,

Don L Kinney

Donald L. Kinney,
Director of Planning

DLK/jb

cc: Craig Kocian, City Manager
Don Allard, Deputy City Manager

city of Northglenn
10701 MELODY DRIVE. • SUITE 618 • NORTHGLENN, COLORADO 80234 • (303) 451-8326

September 10, 1980

Dames & Moore
ATTN: David C. Clark and Paul E. Pigeon
1626 Cole Boulevard
Golden, CO 80401

Dear Sirs:

Thank you for the opportunity to respond to the proposed Clear Creek Interceptor Plans. We have reviewed the material which you sent us along with your letter dated September 5, 1980, and have no negative comments. We are very supportive of the regional trail system concept and would hope that any damage done to existing segments of the trail during the time of construction will be promptly and properly replaced. Also, we would encourage the inclusion within the plans for this project provisions for extension of the trail by means of appropriate land shaping and regrading of the corridor to accommodate a future trail.

Sincerely,

Jerry Starling

Jerome D. Starling
Director of Community Development

JDS/jk

DEPARTMENT OF COMMUNITY DEVELOPMENT

**BOARD
OF
COUNTY COMMISSIONERS**

COMMISSIONERS
Bob Briggs
Ed Harshbarger, Jr.
W.H. Bim Eppinger

**ADMINISTRATION BUILDING
450 SOUTH 4TH AVENUE
BRIGHTON, COLORADO 80601
303-659-2120**

ADMINISTRATIVE DIVISION
PLANNING AND ZONING

September 10, 1980

Mr. David Clark
Mr. Paul Pigeon
Dames & Moore
1626 Cole Blvd.
Golden, Colorado 80401

Dear Mssrs. Clark and Pigeon:

Thank you for your letter dated 5 September 1980 requesting suggestions for alternative multiple uses of the proposed Clear Creek Interceptor right-of-way. It is my understanding that Jon Colt of the Adams County Planning Department Staff has contacted Mr. Pigeon and conveyed to him concerns about the flow changes and loss of agricultural land/productivity which would be brought about as a result of the construction of the interceptor. He also informed me that he loaned copies of the 1979 Water Report and relevant correspondence on the flow issue to your staff for review. I would appreciate the return of those documents to us after your use.

Relative to the question of alternative multiple uses of the interceptor right-of-way, please be advised that Staff feelings persist regarding trail system use for the proposed development area.

Once again, thank you for the opportunity to respond to your comment.

Respectfully,

Jim L. Considine

Jim L. Considine
Acting Planning Director

JLC:ljo

cc: Jon Colt

CITY AND COUNTY OF DENVER

W. H. McNICHOLS, JR.
Mayor

DENVER PLANNING OFFICE

ROOM 400
1445 CLEVELAND PLACE
DENVER, COLORADO 80202
PHONE (303) 575-2736

September 15, 1980

Dames and Moore
1626 Cole Boulevard
Golden, Colorado 80401

Attn: Mr. David C. Clark
Mr. Paul E. Pigeon

Dear Sirs:

Referring to your letter of September 5, 1980, the Denver Planning Office is pleased to offer the following comments regarding the proposed Clear Creek Interceptor sewer. We assume you are talking about alternative 1, although your letter does not specify.

1) The Planning Office is not ready to concede that a "Finding of No Significant Environmental Impact" is appropriate in the case of the proposed Clear Creek Interceptor. This issue should be decided in a public forum.

   The Clear Creek facility plan devoted ten full pages to environmental impacts including proposed mitigation measures. We generally find no problem with the findings of the consultant (CH_2M Hill) and would affirm our support for the environmental mitigation measures proposed in the August 1977 study.

2) Your letter asks for comments on potential multiple uses of the proposed interceptor right-of-way without presenting alternatives for us to comment upon. We therefore have no comment to offer at this time.

3) We suspect, although it is difficult to determine from the vagueness of your correspondence, that any letter from us may be construed as an approval of EPA's "Finding of No Significant Impact" in the case of the proposed Clear Creek Interceptor Sewer.

   Nothing could be further from the truth. In addition to the ten pages of environmental impacts described in the facility plan there are other significant environmental issues involving the question of water quality and water rights on Clear Creek. It is difficult for us to believe that the specific environmental issues along this long corridor can be reduced to a brief "Finding of No Significant Impact."

4) The Planning Office is of the opinion that Clear Creek should not be subjected to the same set of unreasonable additional conditions that were imposed on Sand Creek by the EPA. We take note of the fact that the Clear Creek and Sand Creek study consultant did not recommend such mitigation measures as sewer tap limitations, air quality stipulations, flood plain ordinances, street sweeping ordinances and other dictatorial, peripheral measures.

The central issue is not so called "growth" control, it is the prompt provision of needed sanitary sewer services to protect the health, safety and welfare of the metropolitan community. Until this issue becomes a top priority at all levels there will be no reasonable progress made in the protection of the human environment in this region.

Finally, the very narrow approach in your letter and the provision of extremely limited information on this major sewer issue is somewhat disturbing. Perhaps if the right questions were being asked it would save all of the responsible parties a great deal of time.

Sincerely Yours,

Alan L. Canter

Alan L. Canter
Director of Planning

cc: H. Cook
J. Zohn

ALC/WW/mb

CITY OF COMMERCE CITY
colorado
people & industry together

Department of
Community Development

September 24, 1980

Dames and Moore
Attn: David C. Clark
1626 Cole Blvd.
Golden, CO 80401

Dear Mr. Clark:

Thank you for the opportunity to review the proposed Clear Creek Interceptor project.

Our planning staff recently submitted the project to Commerce City's Growth and Development Committee and the Planning Commission for their consideration.

Upon completion of the review it has been decided that the project will not adversely impact the relatively small portion of the Commerce City area for which it is proposed.

The concerns expressed during the review centered around the general location of the interceptor route in relation to existing and proposed portions of the regional recreation system of the Denver Metro area. In this regard we would suggest that, wherever feasible, the inceptors route facilitate pedestrian access, either directly or indirectly, to this system.

Commerce City has been discussing with Adams County the possibility of developing a portion of this trail system along an existing access road located between the Burlington Ditch and South Platte River. This portion would extend from approximately 58th Ave. to 65th Ave. within our boundaries. Since the inceptors route enters Commerce City at the juction of the South Platte River and 64th Ave., a potential exists for establishing pedestrian access to this portion of the system.

We would appreciate your consideration of this concept. If you have any additional questions please contact me at 287-0151 extension 232.

Sincerely,

Gene Kovacs

Gene Kovacs,
Planner II

GK/dj

6015 forest drive/p.o. box 40/commerce city, colorado 80037 (303) 287-0151

ATTACHMENT C

Requirements for Calculating Additional Capacity Beyond Cost-Effective Capacity
from: Federal Register Wednesday, September 27, 1978 Part III
"EPA Municipal Wastewater Treatment Works", 40 CFR Part 35, Subpart E,
Appendix A:

10. ***Additional capacity beyond the cost-effective capacity.*** Treatment works which propose to include additional capacity beyond the cost-effective capacity determined in accordance with these guidelines may receive Federal grant assistance if the following requirements are met:

a. The facilities plan shall determine the most cost-effective treatment works and its associated capacity in accordance with these guidelines. The facilities plan shall also determine the actual characteristics and total capacity of the treatment works to be built.

b. Only a portion of the cost of the entire proposed treatment works including the additional capacity shall be eligible for Federal funding. The portion of the cost of construction which shall be eligible for Federal funding under sections 203(a) and 202(a) of the Act shall be equivalent to the estimated construction costs of the most cost-effective treatment works. For the eligibility determination, the costs of construction of the actual treatment works and the most cost-effective treatment works must be estimated on a consistent basis. Up-to-date cost curves published by EPA's Office of Water Program Operations or other cost estimating guidance shall be used to determine the cost ratios between cost-effective project components and those of the actual project. These cost ratios shall be multiplied by the step 2 cost and step 3 contract costs of actual components to determine the eligible step 2 and step 3 costs.

c. The actual treatment works to be built shall be assessed. It must be determined that the actual treatment works meets the requirements of the National Environmental Policy Act and all applicable laws, regulations, and guidance, as required of all treatment works by §§ 35.925-8 and 35.925-14. Particular attention should be given to assessing the project's potential secondary environmental effects and to ensuring that air quality standards will not be violated. The actual treatment works' discharge must not cause violations of water quality standards.

d. The Regional Administrator shall approve the plans, specifications, and estimates for the actual treatment works under section 203(a) of the Act, even though EPA will be funding only a portion of its designed capacity.

e. The grantee shall satisfactorily assure the Agency that the funds for the construction costs due to the addtional capacity beyond the cost-effective treatment works' capacity as determined by EPA (i.e., the ineligible portion of the treatment works), as well as the local share of the grant eligible portion of the construction costs will be available.

f. The grantee shall execute appropriate grant conditions or releases providing that the Federal Government is protected from any further claim by the grantee, the State, or any other party for any of the costs of construction due to the additional capacity.

g. Industrial cost recovery shall be based upon the portion of the Federal grant allocable to the treatment of industrial wastes.

h. The grantee must implement a user charge system which applies to the entire service area of the grantee, including any area served by the additional capacity.

Reproduced from best available copy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO 80295

Date FEB 20 1981

FINDING OF NO SIGNIFICANT IMPACT

TO ALL INTERESTED GOVERNMENTAL AGENCIES AND PUBLIC GROUPS:

As required by guidelines for the preparation of environmental impact statements, an environmental review has been performed on the proposed EPA action below:

Project	Wastewater Treatment Facility
Location	Clear Creek, Metropolitan Denver Sanitary Disposal District No. 1 (Metro District), Commerce City, Colorado
Project Number	C 080392-01
Total Cost/EPA Share	$9,779,600./$7,334,700.

The proposed wastewater treatment facility will be designed for a population of 321,000 persons for the year 2000. The existing population of the study area is estimated to be 237,500.

The proposed project is for the construction of a Clear Creek Interceptor to parallel the existing Metro District interceptor. The interceptor will carry flow from anticipated growth in the Clear Creek area; it is sized to also collect the wastewater flows now treated and discharged to Clear Creek at existing in-basin treatment facilities owned and operated by the City of Arvada, Wheat Ridge Water and Sanitation District, and Clear Creek Water and Sanitation District.

The project is not expected to significantly affect wetlands, any known threatened or endangered species habitat, historical resources, or other unique or sensitive environmental values. The study area, however, does include floodplains and prime agricultural lands that may be affected. (For further information concerning these latter issues, refer to page 31, Item 2., regarding floodplain effects, and page 48, Item 6., on agricultural land impacts).

The choice of a parallel interceptor to service this basin gave rise to a number of concerns. Earlier water quality management studies indicated the desirability of a satellite treatment plant on the Creek to maintain in-stream flows and to protect aquatic life and municipal water supply values in Clear Creek. Downstream irrigators have been concerned about the potential loss of agricultural water, if the wastewater flows are moved out of the basin. The City or Golden has reached an agreement with the Coors Corporation to construct a separate treatment facility on Clear Creek. EPA therefore commissioned a special investigation to more accurately define the impacts to the water flow, water quality, water uses, and water rights from the presently proposed wastewater treatment situation. This Technical Report is appended to the Environmental Assessment document for your consideration.

The review process did not indicate that significant environmental impacts would result from the proposed action. Impacts that were defined have been adequately addresed through a number of mitigating measures to be developed as special conditions for future Metro District design and construction grants on this project.

Consequently a preliminary decision has been made not to prepare an EIS under the National Environmental Policy Act. This action is taken on the basis of a careful review of the engineering report facilities plan environmental information documents, the special Technical Report prepared by the firm of Dames and Moore, and other supporting data which are on file in the Office of Public Facilities and Grants. These documents are available for public scrutiny upon request. These documents are also available for review at the Colorado Department of Health.

Comments supporting or disagreeing with this decision should be submitted to EPA for consideration. If further information is required, please contact Mike Gansecki(837-4831) or Ann Egan (837-3961) of the Region VIII staff. After evaluating the comments received, the Agency will make a final decision; however, no administrative action will be taken on the project for at least 30 calendar days after release of the Finding of No Significant Impact.

Gene A. Lucero, Acting
for Roger L. Williams
Regional Adminstrator

ENVIRONMENTAL ASSESSMENT

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PRINCIPAL ABBREVIATIONS

CEA - cost-effectiveness analysis

CEQ - Council on Environmental Quality

cfs - cubic feet per second

DRCOG - Denver Regional Council of Governments

gpm - gallons per minute

HCRS - Heritage Conservation and Recreation Service

MGD - million gallons per day

mg/l - milligrams per liter

SIP - State Implementation Plan

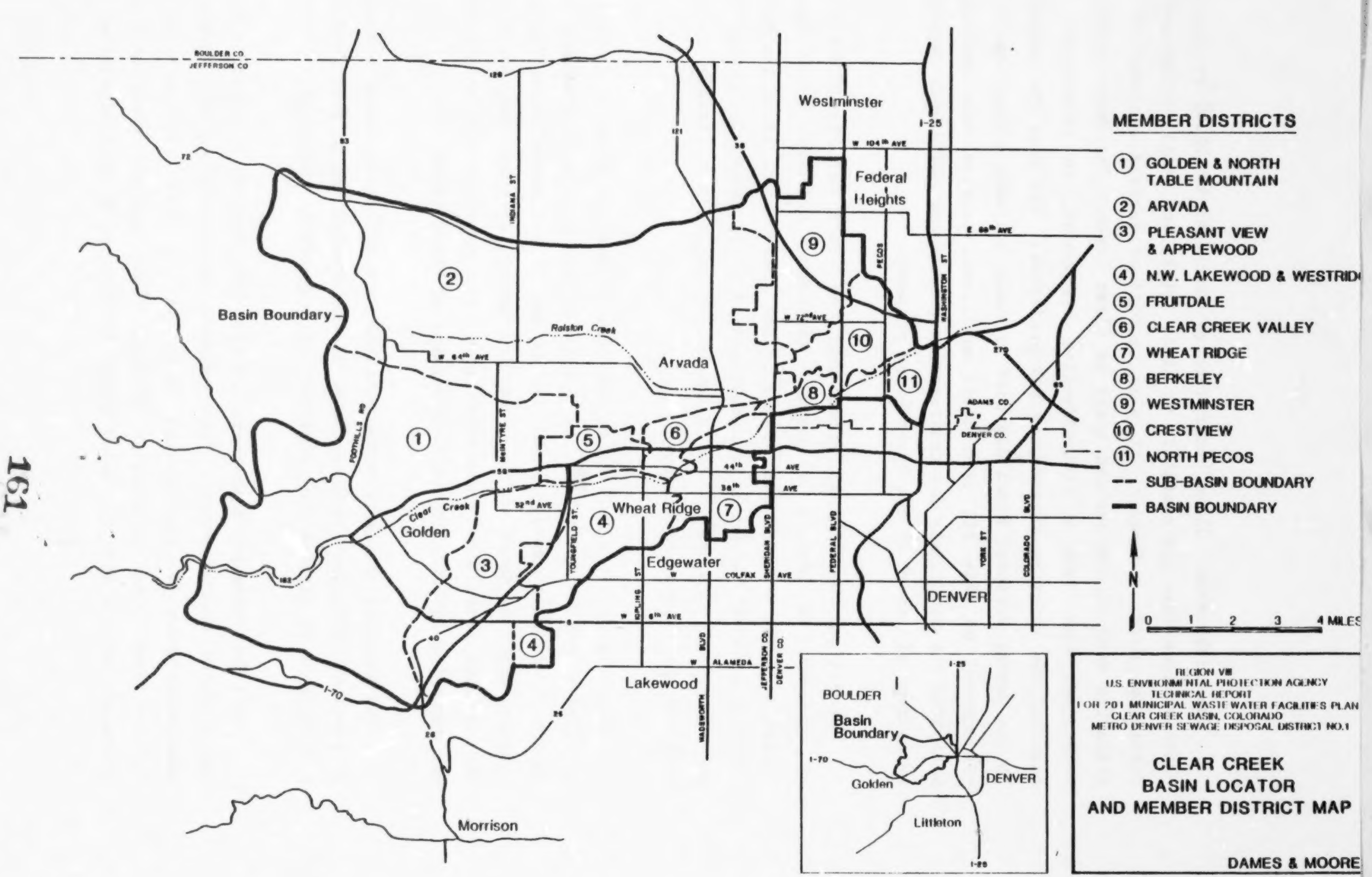
WWTP - wastewater treatment plant

ENVIRONMENTAL ASSESSMENT
Clear Creek Facilities Plan, Metro District

I. NEED FOR ACTION AND BACKGROUND

This Environmental Assessment culminates the decision-making process by EPA for approval of the Step 1 Facilities Plan for Clear Creek Basin, Colorado (Metro District). The facilities plan was prepared in 1976 and 1977, and was one of ten wastewater treatment facilities plans covered under the Denver Regional Final Environmental Impact Statement For Wastewater Facilities and the Clean Water Program done by EPA in 1978.

Wastewater treatment facilities for the Clear Creek Basin (covering the drainage area from the mouth of Clear Creek Canyon near Golden to the South Platte River) have been a controversial subject for some years. The attached Basin Locator Map, Figure 1-1 from the Technical Report Appendix, shows the basin, sub-basins, and relationship to the Denver metropolitan area. Rapid population growth has put severe strains on the existing facilities in the basin, resulting in at least two raw sewage overflows from the existing Metro Interceptor. Additional capacity is needed in the near future. Early water quality studies by DRCOG recommended construction of a satellite wastewater treatment plant on Clear Creek to protect aquatic life, water supply, agricultural, and recreational goals. Agricultural interests in lower Clear Creek have complained about the water losses over time with increasing urbanization (including the initial Metro District Clear Creek Interceptor). Municipal water supplies have historically been drawn from Clear Creek (Crestview Water and Sanitation District, Golden, etc.), and newer, growing municipalities have been actively seeking Clear Creek as a good quality and dependable source of water. Gravel operations, landfills, urban runoff, agricultural return flows, and wastewater treatment discharges have all contributed to deteriorated water quality in Clear Creek.


MEMBER DISTRICTS
① GOLDEN & NORTH TABLE MOUNTAIN
② ARVADA
③ PLEASANT VIEW & APPLEWOOD
④ N.W. LAKEWOOD & WESTRID
⑤ FRUITDALE
⑥ CLEAR CREEK VALLEY
⑦ WHEAT RIDGE
⑧ BERKELEY
⑨ WESTMINSTER
⑩ CRESTVIEW
⑪ NORTH PECOS
SUB-BASIN BOUNDARY
BASIN BOUNDARY
N
0 1 2 3 4 MILES
BOULDER CO
JEFFERSON CO
Westminster
Federal Heights
Basin Boundary
Arvada
Ralston Creek
Clear Creek
Golden
Wheat Ridge
Edgewater
Lakewood
Morrison
DENVER
ADAMS CO
DENVER CO
JEFFERSON CO
I-25
I-70
W 104th AVE
E 88th AVE
W 72nd AVE
W 64th AVE
52nd AVE
44th AVE
38th AVE
COLFAX AVE
W 6th AVE
W ALAMEDA
INDIANA ST
McINTYRE ST
FOOTHILLS RD
YOUNGFIELD ST
KIPLING ST
WADSWORTH BLVD
SHERIDAN BLVD
FEDERAL BLVD
PECOS
WASHINGTON ST
YORK ST
COLORADO BLVD
BOULDER
Basin Boundary
Golden
DENVER
Littleton
72
128
93
121
36
270
58
6
40
26
285
152

REGION VIII
U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL REPORT
FOR 201 MUNICIPAL WASTEWATER FACILITIES PLAN
CLEAR CREEK BASIN, COLORADO
METRO DENVER SEWAGE DISPOSAL DISTRICT NO.1

CLEAR CREEK
BASIN LOCATOR
AND MEMBER DISTRICT MAP

DAMES & MOORE

FIGURE I–

The more recent Clean Water Program developed by DRCOG recognized these various uses and conflicts on Clear Creek, and still recommended a satellite plant. However, it also recognized serious constraints to achieving many of the desired goals on Clear Creek. The Metro District determined that from a cost-effective standpoint, an interceptor to parallel the existing interceptor was preferred. EPA took the position in the Denver Regional Final EIS that it would not make a final decision of approval on this 201 plan until additional studies were performed analyzing the potentials for treatment on Clear Creek and a more detailed assessment of impact of the interceptor proposal.

Recently, the City of Golden and the Coors Corporation signed an agreement to develop a separate wastewater treatment plant below Golden to treat the combined flows. Since this project is in the Metro District of which Golden is a member and it could materially change the environmental impacts on Clear Creek, it was felt necessary to re-evaluate the stream conditions.

EPA, therefore, commissioned the firm of Dames & Moore to develop a detailed water flow, rights, and quality investigation to evaluate the impacts identified above, as well as to see if any potential mitigation measures might be developed to lessen the impacts of these twin projects. EPA is also particularly concerned about the potential for maintaining and upgrading aquatic life in this segment of Clear Creek.

The appended document represents the work effort by Dames & Moore. It looks at conditions on Clear Creek in the present and in year 2000 for a variety of situations and assesses their impacts on the creek.

This Environmental Assessment has been developed in conjunction with the attached special study. This document constitutes an Environmental Assessment under EPA regulations, 40 CFR Part 6, (CFR November 6, 1979) for the Clear Creek Interceptor Project. This document summarizes the principal impacts with the Clear Creek Interceptor Project identified in various studies and the earlier Regional EIS. The Environmental Assessment also contains EPA's evaluation of the Dames & Moore study, required mitigation measures, and a discussion of why EPA does not believe an EIS is required.

This Environmental Assessment is issued for the purpose of describing the economic, engineering, and environmental aspects of the facilities planning process for the Clear Creek Basin. The reasoning and methodologies used in the resolution of issues which have arisen during the decision-making process are presented below, along with the role of interested agencies and the public in that process. Mitigation measures are identified which are necessary to assure implementation of the proposed project in an environmentally sound manner. The documents used in developing the analysis for this Environmental Assessment are listed under Section VII.

II. ALTERNATIVES INCLUDING PROPOSED ACTION

A. INTRODUCTION

The Clear Creek Facility Plan developed by CH2M-Hill for the Metro District included a wide range of alternatives involving the following methods of effluent control: 1) treatment and discharge, 2) treatment and reuse, and 3) land application. Since existing wastewater disposal practices in the Clear Creek Basin involve both in-basin treatment and treatment at the Metro District Central Plant, which is a regional plant servicing several sectors of the Denver Metropolitan area, the alternative analysis included a mix of in-basin and centralized treatment alternatives.

Since all of the alternatives involved continuation or expansion of treatment capacity at the Metro District Central Plant for wastewater flows from the Clear Creek Basin, a computerized analysis of Central Plant costs was prepared. Using the estimated inflation rate, interest rate, learning curve effect, and economy-of-scale factor to determine a phasing period of 10 years at the Central Plant, the analysis yielded optimized capital and operation and maintenance costs accruing to Clear Creek Basin wastewaters for 1) secondary treatment facilities by 1981, 2) ammonia conversion facilities by 1983, and 3) expansion of both facilities by 1991. The computerized analysis included preliminary consideration of 832 possible facilities combinations for the four major Denver area basins and more detailed screening of 168 options.

The alternatives analysis did not evaluate a separate Golden/Coors wastewater treatment facility. All of the following alternatives must be viewed in light of separate treatment in the City of Golden's service area. Some of the Metro satellite alternatives are similar to the Golden proposal.

B. RANGE OF ALTERNATIVES

A range of alternatives involving centralized treatment, satellite plants, and all three effluent control methods were considered and are described as follows:

Alternative No. 1 - Parallel Clear Creek Interceptor for the entire planning area;

Alternative No. 2 - Satellite Wastewater Treatment Plant at 40th and Youngfield for flows from Golden, North Table Mountain, Applewood, and Pleasant View, with a parallel Clear Creek Interceptor for the rest of the planning area;

Alternative No. 3 - Satellite Wastewater Treatment Plant at Tennyson and 56th for flows from Golden, North Table Mountain, Applewood, Pleasant View, Northwest Lakewood, Westridge, Fruitdale, and Wheat Ridge, with a parallel Clear Creek Interceptor for the lower part of the planning area;

Alternative No. 4 - Parallel Clear Creek Interceptor for the entire planning area, with flow equalization at Tennyson and 56th for Golden, North Table Mountain, Applewood, Pleasant View, Northwest Lakewood, Westridge, Fruitdale, Wheat Ridge, and Arvada;

Alternative No. 5 - Land application by infiltration - percolation basins at 44th and McIntyre for Golden, North Table Mountain, Applewood, and Pleasant View with pretreatment by aerated lagoons, and a parallel Clear Creek Interceptor for the rest of the planning area;

Alternative No. 6 - Land application by high-rate irrigation at 64th and Indiana for Golden, North Table Mountain, Applewood, and Pleasant View, pretreatment by aerated lagoons, and parallel Clear Creek Interceptor for the rest of the basin;

Alternative No. 7 - Infiltration-percolation basins at 58th and Sheridan for Golden, North Table Mountain, Applewood, Pleasant View, Northwest Lakewood, Westridge, Fruitdale, and Wheat Ridge, pretreatment by aerated lagoons, and parallel Clear Creek Interceptor for the lower part of the planning area; and, Alternative No. 8 - Satellite advanced wastewater treatment plant at 40th and Youngfield with urban irrigation reuse for Golden, North Table Mountain, Applewood, and Pleasant View, with parallel Clear Creek Interceptor for the rest of the planning area.

C. ALTERNATIVE ANALYSIS

Initially, alternative Nos. 3, 4, 6, and 7 were eliminated from further analysis on the basis of their significantly higher project costs. This screening out of alternatives held true whether or not ammonia conversion facilities were assumed to be necessary. Of the remaining alternatives, No. 8, involving reuse of effluent, was deemed infeasible upon re-evaluation of problems involving water rights.

The remaining alternatives, Nos. 1, 2, and 5 were evaluated on the basis of economic, engineering, implementation, environmental, and other miscellaneous considerations. Table 1 summarizes the categories in which the alternatives were evaluated.

TABLE 1

ALTERNATIVE EVALUATION CATEGORIES

Economic
- Present Worth Costs
- Annual Costs

Environmental
- Climatological Effects
- Air Quality
- Ground Water
- Soils and Geology
- Vegetation/Wildlife
- Hydrology/Water Quality
- Aquatic Environment
- Vectors
- Land Use
- Health and Safety
- Aesthetics
- Socioeconomic Considerations

Engineering
- Net Energy Consumption
- Chemical Consumption
- Utilization of Existing Facilities
- Reliability of Operation
- Ability to Upgrade to a Higher Treatment Level
- Ability to Expand
- Effluent Quality

Implementation
- Institutional
- Financial
- Legal
- Public Sentiment
- Agency Sentiment

Miscellaneous
- Compliance with DRCOG Water Quality Management Plan
- Golden's Water Rights Problem
- Flow Augmentation

Each of the evaluation categories was assessed in a weighted numerical ranking process. Weighting factors and relative impact scores for all but the Public Sentiment and Agency Sentiment categories were assigned in the facilities plan during preparation of the Phase I Report. Public and agency sentiments were obtained by soliciting written and oral comments from 186 recipients of copies of the Phase I Report, and by conducting a well advertised public meeting, held November 11, 1976. As a result of the public meeting, weighting factors for several of the evaluation categories were revised through completion of questionnaires by the meeting participants. Also, the questionnaires showed a willingness of the public to pay higher sewer bills of not more than 10 percent to maintain flow in Clear Creek. Commensurate with this sentiment, the meeting participants favored Alternative No. 2; the Satellite Plant at 40th and Youngfield; the second choice was Alternative No. 1, the Clear Creek Interceptor and Centralized Plant.

Based on public and agency sentiment, and information on reuse and water rights presented after release of the Phase I Report, Alternative No. 8 was reconsidered and, along with Alternative No. 2, modified to include nitrogen removal for wastewaters discharged to Clear Creek in order to protect domestic water supplies. Alternative Nos. 9 and 10 were added, which are the same as Alternative Nos. 2 and 8, but with a larger Youngfield Satellite Plant service area including the Northwest Lakewood/ Westridge sub-basin.

All alternatives were then re-evaluated and Alternative No. 1, the Clear Creek Interceptor, was recommended to and accepted by the Metro District Board of Directors. Other alternatives, which would have reuse, flow augmentation, and water rights benefits, were rejected since they could increase sewer charges to Clear Creek Basin residents by more than 10 percent over Alternative No. 1. More detailed analyses of the benefits and impacts of the Clear Creek Interceptor and alternatives involving in-basin treatment facilities were provided in the Clear Creek Facilities Plan and the Leonard Rice Water Rights Impacts of Clear Creek

Facility Planning report. These analyses have been reviewed and extended in the Technical Report Appendix and are summarized in the following chapters.

D. PROPOSED ACTION

The chosen plan is the Clear Creek Interceptor Project which includes the following major components:

1) gravity sewers, ranging in size from 33- to 72-inches diameter, on the main route of the interceptor;
2) pipe crossings of Clear Creek, Ralston Creek, railroads, streets, and freeways;
3) modification of the existing siphon structure under the South Platte River at 64th Avenue and York Street; and,
4) relocation of several sections of the existing interceptor due to Interstate Highway 76 construction.

Excluding costs of $806,700 expected to be borne by the Colorado Department of Highways, the total capital costs of the Clear Creek Interceptor Project are estimated at $9,779,600, using June, 1979 as the expected mid-point of the design-construction phase. Cost factors will have to be readjusted to reflect the proposed 1983 date for funding.

The exact routing of the interceptor will be finalized during the design phase, especially in the area from just west of Wadsworth Boulevard to about one-third mile west of Broadway, where the interceptor routing will be coordinated with routing and construction of I-76 wherever possible. Although the Division of Highways and Metro District are in agreement on the need to coordinate construction, the uncertain funding and scheduling of I-76 will not allow early resolution of these routing problems. In the areas where the existing interceptor will have to be abondoned due to access problems associated with the expected I-76 right-of-way, the proposed interceptor will be sized to take all intercepted flows.

The overall sizing of the Clear Creek Interceptor (33- to 72-inch diameter) was based on population and land use data approved by DRCOG and EPA cost-effectiveness analysis (CEA) guidelines in effect in 1977. The population and land use data and other design criteria limited by EPA's present CEA guidelines will be revised during the initial phase of the design process in Step 2 to establish the EPA fundable interceptor sizing. The Metro District has also indicated its intent to develop a second larger interceptor sizing based on its desire to construct for a longer design life. Metro district will have to evaluate any larger sized interceptor to determine what portion, if any, EPA can fund. A supplemental environmental assessment analysis and consistency determination with the SIP will be necessary.

The Clear Creek Interceptor will be sized to accept wastewater now treated and discharged to Clear Creek at existing in-basin treatment facilities owned and operated by Arvada, Wheat Ridge Sanitation District, and Clear Creek Water and Sanitation District. Also, although not a part of the EPA funded project, facilities planned for use by Golden and Coors play an important part in the overall picture of wastewater disposal in the Clear Creek Basin (see Appendix pp. 3-2 and 3-3). If Golden's pending petition to exit the Metro District is accepted, the Clear Creek Interceptor will be sized without capacity for Golden wastewater.

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[a] Population and land use data are developed and updated by DRCOG for wastewater planning and design in the Denver Metro area for purposes of EPA funding.

III. AFFECTED ENVIRONMENT

Recent Council on Environmental Quality (CEQ) regulations have stressed the need for relating descriptions of the environment to the areas of likely impact. This section defines the principal environmental impact areas resulting from the Clear Creek projects under their present conditions. The following impact areas will be separately discussed below:

A. Corridor Location for the Interceptor - Construction Impacts/ Wetlands/Cultural Resources

B. Sizing and Timing of the Project - Secondary Impacts Related to Urban Growth

C. Treatment Levels and Operation of the Wastewater Treatment System - In-Basin WWTPs/Water Flow/Water Quality/Aquatic Life/Agricultural Lands

The Golden/Coors plant is included only under the latter discussion, since it can have a significant impact on the Clear Creek stream regime. The project is being constructed with private or local funds and no impact assessment of direct or secondary impacts is considered.

A. CORRIDOR LOCATION FOR THE INTERCEPTOR

The Clear Creek planning area is the hydrological drainage basin of Clear Creek from the mouth of Clear Creek Canyon to its confluence with the South Platte River. The area is predominantly within the metropolitan Denver area and is highly urbanized. Those remaining non-urban lands are for the most part subject to intense rapid urbanization pressures. The area is serviced by the Metro District through an interceptor that takes flows from as far upstream as Golden to the central treatment plant at Commerce City. Metro District member agencies within the Clear Creek planning area include the cities of Golden, Arvada, and Westminster; water and sanitation districts of North Table Mountain, Applewood, Pleasant View, Berkeley, Crestview, and North Pecos; and, sanitation districts of Northwest Lakewood, Westridge, Fruitdale, and Wheat Ridge. These member agencies maintain certain collection and pumping facilities within their individual service areas, draining to one or more metering stations owned and maintained by Metro District just above discharges into the existing Metro interceptor system. Clear Creek Valley Water and Sanitation District lies within the planning area although not a Metro District member, maintaining separate collection and treatment facilities. Golden has requested permission to exit the Metro District as part of plans to have its wastewater treated in-basin at facilities owned and operated by the Adolph Coors Company.

Present uses along the interceptor route include open space (greenbelt), developed parkland, residential, light industrial/commercial, transportation, and agricultural and rural residential. Historically, land use in the Clear Creek Basin was chiefly agricultural prior to World War II, and included a substantial sector of fruit growing and truck vegetable farming utilizing irrigation water from Clear Creek. Creek water was used extensively for out-of-basin irrigation as early as the 1880s, causing a fluctuating, partially dewatered flow condition which has intensified in recent decades.

Since World War II, the character of Clear Creek corridor land and water uses have changed rapidly to urbanized conditions, with heavy industrial, commercial, and residential development filling in and replacing agricultural and rural residential areas. These developments have caused changes in uses of a substantial portion of Clear Creek water from agricultural to industrial, potable and park and recreational uses, although a portion of Clear Creek water is still used in- and out-of-basin for irrigation. Today, continued residential and industrial developments in the northwest sector of the Denver metropolitan area place ever-increasing pressures on Clear Creek in terms of water use, availability, and quality. Although not a heavy water-use industry, gravel mining operations have since World War II become one of the predominant Clear Creek floodplain land uses, along with parks, open space, and light industrial.

The interceptor route will generally follow the northern side of the Clear Creek floodplain and first or lowest gravel terrace from its westerly end at 40th Avenue and Youngfield Street to just west of Pecos Street, where the route crosses Clear Creek and angles away from Clear Creek in an easterly direction along 64th Avenue to the existing siphon structure at 64th and York Street. While modification of the siphon inlet structure is planned, no construction is anticipated in the South Platte River along the siphon route to the Metro District Central Plant headworks on the east bank of the river at York. The proposed interceptor will parallel the existing pipeline, sharing a common right-of-way along much of its length, replace the existing pipeline along portions of the route between Wadsworth Boulevard and Pecos, and follow an alternate route in the section east of Pecos.

Sensitive construction areas include the Wheat Ridge Greenbelt from Youngfield to Wadsworth; the segments where the route will contact the I-76 right-of-way between Wadsworth and 1,000 feet west of Broadway; several points where the pipeline construction will occur quite close to the main Clear Creek stream channel in the Youngfield to Kipling Street and Kipling to Wadsworth segments; the crossings of Clear Creek near Pecos, and Ralston Creek at 56th Avenue; several areas where the pipeline will cross producing agricultural lands; and construction adjacent to residential lots between Youngfield and Xenon Street and between 44th Avenue and Carr Street in 750 and 1,500 foot pipe reaches, respectively.

There are no Federally designated nor State-controlled wetlands along the route. However, there are numerous operating and abandoned flooded gravel pits along the route, some of which are controlled by local governments and incorporated into existing and future planned park and open space systems (Appendix pp. 2-81 and 2-82). These pit ponds, as well as Clear Creek itself, serve as nesting and resting habitat for resident populations of waterfowl. A small portion of a pit pond just west of Tennyson Street will be filled in by interceptor construction adjacent to the planned I-76 right-of-way. The above mentioned stream crossings of Clear and Ralston Creeks also have the possibility of affecting waterfowl habitat on a temporary basis. They will involve small excavations in the streambed for laying pipelines and partial or complete interruption of streamflow for short periods (several hours). Neither type of effect (pond filling and stream crossing) is expected to significantly impact the waterfowl habitat resource.

The State Historical Society has not identified any buildings or other features in the Clear Creek planning area which have historical significance. However, the riparian and floodplain zones along the Clear Creek corridor have the potential for discovery of archaeological sites. The high natural base flow of Clear Creek made it highly attractive for use by native American cultures prior to the appearance of white men early in the 19th century.

Recreation plans currently in effect in the Clear Creek Basin include those performed by agencies with interjurisdictional responsibilities (the Denver Regional Council of Governments (DRCOG), Colorado Division of Parks and Outdoor Recreation, and the Jefferson County Open Space Program), and those performed by local jurisdictions (the cities of Wheat Ridge, Arvada, Lakewood, Westminster, Golden, and Adams County). The major features of recreational plans are summarized in the DRCOG Regional Growth and Development Plan (1978, as amended), which contains a trails and parks element. The Clear Creek Basin corridor is a central axis of the planned and existing regional trails system. Within the Clear Creek Basin, most of the Clear Creek bike trail has been completed, and within Wheat Ridge a greenbelt corridor has also been completed.

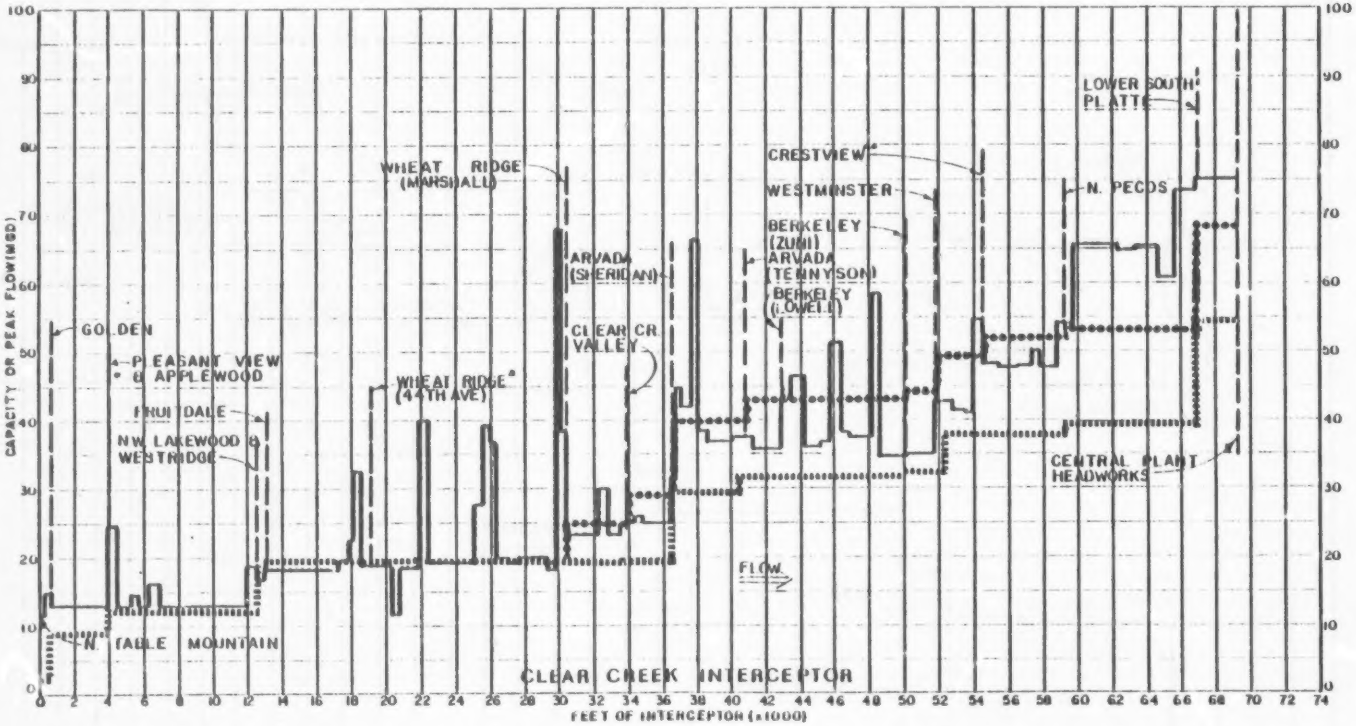
Numerous funding sources have been used and are available to support recreation plan implementation. Each jurisdiction within the Clear Creek Basin uses some general fund monies in planning, design, and implementation. Within Jefferson County, planning, design, purchase of land, and some construction is funded through the Jefferson County

Open Space Program by a one-half cent sales tax. Proceeds from the tax are shared by cities as well as unincorporated Jefferson County. The State Division of Parks and Outdoor Recreation has in the past made funds available to local jurisdictions on a 50-50 matching basis, but does not currently have available monies. At the federal level, there are three major funding sources for recreation trails: (1) Clean Water Act Section 201 funds for recreational use of wastewater facilities, (2) Heritage Conservation and Recreation Service (HCRS) Land and Water Conservation funds, and (3) Federal Highways Administration funds. The federal sources all require a local match, from 20 percent for Federal Highways funds to 50 percent for HCRS monies.

B. SIZING AND TIMING OF THE PROJECT

The Clear Creek Interceptor Project has been proposed both as a means of relieving existing interceptor overloading problems and of servicing planned future population growth. The attached reproduction of Figure 3-3 from the Facility Plan illustrates the overloading problem. Above the Wheat Ridge WWTP at Marshall Street, 1975 peak flows were at or slightly above existing interceptor capacity. Below Marshall down to the North Pecos connection, 1975 peak flows would have substantially exceeded interceptor capacity if the Wheat Ridge, Clear Creek Valley, and Arvada WWTP's were closed. Raw sewage over flows were observed and estimated by Metro District personnel on June 8-9, 1975 at 500-1000 gallons per minute (gpm) near Tennyson Street and 20 gpm at the Fruitdale connection. Figure 8-5 from the Facility Plan shows the combined proposed interceptor capacity from both the existing and proposed interceptors and year 2000 peak flows. The proposed capacity will be achieved by the project as described in Table 2.

The proposed Clear Creek Interceptor Project will either parallel or replace the existing Metro Interceptor along the total reach from Youngfield Street to the South Platte River. The project will also include major appurtenances and several sensitive construction areas, all of which are listed below.



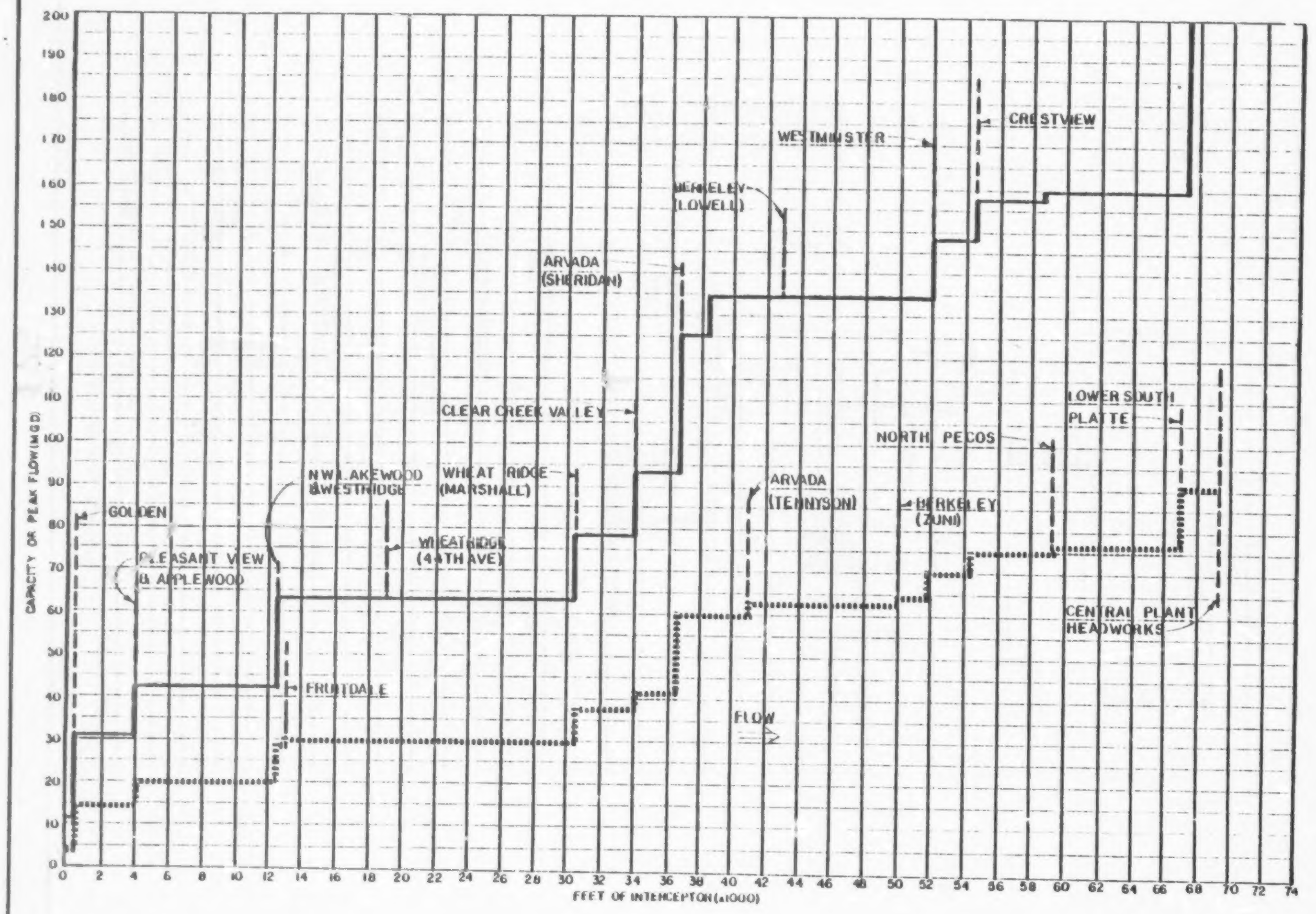
* THIS CONNECTION NOT OPERATING IN 1975

** CRESTVIEW PLANT CEASED OPERATION IN 1977
FLOW NOW DISCHARGES TO CLEAR CREEK INTERCEPION.

Figure 3-3
CLEAR CREEK
INTERCEPTOR
CAPACITIES
AND ESTIMATED
PEAK FLOWS

CH2M HILL

D9728.80



LEGEND
— PROPOSED INTERCEPTOR CAPACITY
▪▪▪▪▪▪ 2000 PEAK FLOW

Figure 8-5
CLEAR CREEK
INTERCEPTOR PROPOSED
CAPACITY AND
2000 PEAK FLOW

CH2M HILL
METROPOLITAN DENVER SEWAGE DISPOSAL DISTRICT NO. 1

D5726.BC

TABLE 2

Clear Creek Interceptor Project
Construction Features

8-inch pipeline[a]	490 feet
18-inch pipeline	500 feet
33-inch pipeline	8,130 feet
36-inch pipeline	210 feet
42-inch pipeline	6,090 feet
48-inch pipeline	10,400 feet
54-inch pipeline	2,710 feet
60-inch pipeline	20,690 feet
66-inch pipeline	6,640 feet
72-inch pipeline	7,700 feet
Clear Creek and Ralston Creek Crossings	
Railroad Crossings	2
Street Crossings	16
Street Resurfacing	17,700 feet
I-25 Freeway Crossing Fill Material	15,000 cubic yards
Move and Reconnect Berkeley (Lowell) Meter	
Dewatering (removal of surface/ground waters from construction areas)	
Special Structures (splitter, combiner, crossover, major connections)	15
Rework South Platte River Siphon Inlet Box.	

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[a] Pipelines include pipe, manholes, excavation, and backfill.

As described in Section II, the proposed interceptor project was designed based on cost-effectiveness analysis (CEA) guidelines in effect in 1977. Table 3 shows the design basis of the interceptor using Facility Plan data.

TABLE 3

Design Populations and Wastewater Flows

	Population	Flow, MGD
1980 Total	237,500	28.0
1980 (minus Golden)	221,500	25.0
2000 Total	321,000	38.6
2000 (minus Golden)	295,000	34.3

The interceptor was originally planned to include Golden, and was based on projections of 1975 population and land uses. Also, the projected year 2000 flow was based on the assumption that per capita wastewater flows will increase. The design was also based on the pipe flowing one-half full at the year 2000 flow of 38.6 MGD.

For purposes of EPA funded municipal wastewater projects in the Denver metro area, land use and population data used in the planning of future service areas and wasteloads are provided by or approved by DRCOG. DRCOG, in December, 1976, approved the land use/population data used in the Clear Creek Facility Plan. As part of its Clean Water Plan updating process, DRCOG has revised its estimates to accommodate more recent information and will continue this process using 1980 U.S. census results. These will be the same estimates used in the State Implementation Plan (SIP) for air quality maintenance.

Redesign of the interceptor at the beginning of Step 2 may include deletion of Golden from the service area. Also, updated populations and land use projections based on the 1980 census will be used consistent with DRCOG projections and the SIP. In addition, following requirements of the current CEA guidelines, per capita flows will be held constant at existing levels and pipe size will be determined based on full flow at the year 2000 population. These factors will result in a smaller size federally fundable interceptor eligible for Federal funds than the one described above.

Metro District has expressed the desire to design and construct a larger interceptor so that no future construction would ever be required along the Clear Creek corridor. The basis of design would include population and land use projections for full development and expansion of the service area. Federal participation in such a full development project would be based on a NEPA analysis and costs of the fully fundable pipeline.

Regional issues, associated with the overall effects of wastewater management activities such as the Clear Creek Interceptor and Federal participation in same in the Denver Metro area have been assessed in the DRCOG Clean Water Plan, EPA's Final Denver Regional EIS and EPA's Record of Final Action on the Denver Regional EIS. These documents assessed socioeconomic impacts, costs and revenue considerations, land use change, conversion of agricultural lands, air quality impacts, water quality, growth induced impacts on sensitive areas, and direct environmental impacts associated with regionwide plans for wastewater managment. This document includes no reassessment of regional and cumulative impacts. However, the regional EIS record of decision contained a listing of twelve conditions to be met by all grantees for Step 2 (design) and Step 3 (construction) monies, in the Denver Metro Area. These will be applied to the Clear Creek Interceptor Project as it proceeds beyond the planning stage, to provide mitigation of regionwide impacts as they relate to the Clear Creek Basin. (See Section V, B).

C. TREATMENT LEVELS AND OPERATION OF THE WASTEWATER TREATMENT SYSTEM

1. In-Basin WWTP's

There are three existing municipal wastewater treatment plants (WWTP's) in the Clear Creek Basin; the only major industrial discharge is from the Coors process WWTP. The three municipal plants, operated by City of Arvada, Wheat Ridge Sanitation District, and Clear Creek Valley Water and Sanitation District, all discharge marginal secondary effluent to Clear Creek between Wadsworth and Sheridan Boulevards. Actually, Arvada's plant discharges to Ralston Creek, about 400 feet above its confluence with Clear Creek. The Coors process WWTP discharges the equivalent of polished secondary effluent, with low ammonia nitrogen concentration (< 2mg/l as N) due to low influent nitrogen content, to two points in the upper part of the planning area. During winter months, effluent goes to Croke Canal, about one mile east of the brewery; the rest of the year, effluent is discharged to Clear Creek just east of McIntyre. Coors fails to meet the total chlorine residual permit limitation of 0.05 mg/l for discharge to Clear Creek. The treatment plant flows and capacities are shown in the Table 4; details on effluent quality and standards are shown in the Technical Report Appendix (Table 2-1, p. 2-4).

TABLE 4

In-Basin WWTP's
Existing Flows and Capacities
(in MGD)

	Flow	Capacity
Arvada	0.82	0.90
Clear Creek Valley	1.85	2.10
Wheat Ridge	1.57	2.50
Coors	3.20	6.50

2. Water Rights

Clear Creek is an over-appropriated stream under the Colorado prior appropriation system of water rights; even in the years of highest streamflow, total demands for water exceed the supply. Many junior water rights on Clear Creek have never been supplied.

Use of water from Clear Creek has gradually changed since World War II from strictly agricultural use to urbanized uses for parks irrigation and residential, commercial, and industrial needs. At present, ownership of water in most of the ditches which divert from Clear Creek reflects 30 to 100 percent use by municipalities and industries.

Major industrial users include Coors and Public Service Company of Colorado. Municipal users include Golden, Consolidated Mutual Water Company, Crestview Water and Sanitation District and Wheat Ridge, which use water mostly within the basin, and Broomfield, Westminster, Northglenn, and Thornton, which use water outside the basin chiefly in the South Platte River, Big Dry Creek, and Coal Creek Basins. Details of water rights holdings on Clear Creek are contained in Section 2.2 of the Appendix (pp. 2-6 through 2-22).

Patterns of diversions and calls for water by appropriators are important to the overall streamflow and quality of Clear Creek. During the winter, Croke Canal, about one mile below Coors brewery, calls for water using its 1902 water rights and dries up the creek below its headgate. Before runoff starts, Croke Canal usually ceases diversion and calls on the creek originate from the South Platte River until June, so that flow remains higher in Clear Creek. From June through October, calls progress from the more junior Farmers Highline Canal 1872 right to the more senior Fisher Ditch 1861 and Clear Creek and Platte River Ditch 1861 rights indicating that available streamflows are dropping. During this period, the calling ditches virtually dry up Clear Creek at their headgates. Lowest flows result during August through October, when the latter two ditches are calling for water. During drier years, the senior calls occur earlier.

3. Streamflow

There are roughly three streamflow and use situations on Clear Creek below Golden during the year, including wintertime, runoff period, and late summer/fall irrigation season. During the winter period, roughly November through March, there are only six diversions from the creek, but base flows at the Golden gauge are also low, ranging from 35 to 70 cfs in dry to average hydrologic years. Croke Canal takes essentially all the creek flow at a point about one mile east of the Coors brewery, resulting in critical low flows (assumed less than 3 cfs) until the Wheat Ridge WWTP at Marshall Street. Below the Wheat Ridge plant, flows are below 20 cfs but above the assumed critical 3 cfs value all the way to the South Platte River, including below the Fisher Ditch at Lowell Boulevard, which is another significant winter diversion.

During the runoff period, roughly April through July, flows are much higher than winter, varying from 150 to 750 cfs in dry to average years. Croke Canal normally does not divert during this period, but all other ditches divert at high rates during this period. Below Golden streamflow remains high, with a low monthly average flow in the entire segment of about 24 cfs below the Clear Creek and Platte River Ditch, about one-third mile east of Pecos.

During the late summer/fall irrigation season, roughly August through October, base flows at the Golden gauge are lower than during the runoff period, ranging from about 70 to 200 cfs in dry to average years. Many ditches are diverting water during this period, and certain junior ditches are not receiving all the water they need (see item B2 above). Critical low flows occur in Clear Creek from the Slough Association Ditch headgate just west of Youngfield Street down to the Wheat Ridge WWTP, just below the Fisher Ditch, and from the Clear Creek and Platte River Ditch headgate east to the South Platte River.

Within the segment of Clear Creek below Golden, streamflow is not controlled by natural hydrologic and meteorological conditions, as a free flowing stream would be. Although flow from upstream of Golden increases from dry to average years, diversions also increase in the segment below Golden. Therefote, streamflow below Golden does not vary greatly between average and dry years.

4. Water Quality

Clear Creek water quality has been historically affected by the dewatering effects of diversions, WWTP discharges, abandoned mine drainage above the planning area, and urban and agricultural runoff. Diversions out of the basin are an especially acute impact, in that they reduce the amount of creek flow available for dilution of existing point and non-point pollution sources in the basin. Low flows are most pronounced during wintertime in the reach of Clear Creek below Croke Canal, which diverts the entire flow at a point one mile east of Coors brewery to Lena Gulch, and during late summer to fall, when ditch diversions at several points along Clear Creek divert the entire flow. These points include:

a) the reach from the Slough Association Ditch headgate just west of Youngfield to the Wheat Ridge WWTP discharge at Marshall Street;

b) the reach below Fisher Ditch headgate at Lowell for a distance of about one-third mile; and

c) the reach from the Clear Creek and Platte River/Colorado Agricultural Ditch headgate one-half mile east of Pecos to the South Platte River. These are defined as critically dewatered reaches during late summer, having monthly average flows of less than 3 cfs.

Based on an analysis of streamflows (Appendix pp. 2-22 through 2-42), previous wasteload allocation studies by DRCOG, and existing WWTP discharge records, it appears that the plants now operating along Clear Creek have significant water quality impacts. This appears to be the case despite the fact that the plants meet most of the effluent discharge standards in their effluent discharge permits most of the time. Specific in-stream quality problems contributed to by WWTP's have been associated with residual chlorine, ammonia, and fecal coliform (Appendix pp. 2-47 through 2-55). The future effects of more stringent water quality standards, now under consideration by the Colorado Water Quality Control Commission, on the discharge standards are discussed in Section IV.

Urban runoff and agricultural runoff in combination have been identified as the largest source of Clear Creek pollution, when compared to point sources, in the DRCOG Clean Water Plan of 1977. The primary pollutants contributed by urban runoff include suspended solids, phosphous and nitrogen, oil and grease, heavy metals, and fecal coliform. Agricultural return flow contributes nitrogen, phosphous, dissolved solids, chemical pesticides and fertilizers. Total annual pollutant loadings from urban runoff are known to be higher than those from agricultural runoff. Agricultural runoff contributions to Clear Creek are concentrated above Kipling Street and in discharges from Ralston and Little Dry Creeks and Lena Gulch, while urban runoff impacts on Clear Creek are concentracted between Kipling Street and Sheridan Boulevard.

Abandoned and operating landfills in the basin may be causing Clear Creek water quality degradation through leachate contamination of ground water return flows. Numerous abandoned and operating landfills are located close to Clear Creek in the segment between Sheridan and Broadway Boulevards. Actual monitoring data on landfill leachates is not extensive for the planning area, but increasing iron and manganese concentrations, common landfill pollutants, in the reach from above to below the location of numerous landfills indicates the possible influence of leachates on Clear Creek water quality.

Numerous abandoned mines in the Idaho Springs area and along North Clear Creek near Central City contribute significant loadings of acids and heavy metals to Clear Creek, so that heavy metals are the most significant pollutants at the gauge above Golden on the west side of the planning area. Subsequent streamflow diversions and returns of relatively metal-free flows in the planning area reduce the significance of metals. Copper and zinc, both present in significant concentrations above Golden, decrease to the east downstream along Clear Creek. Significant heavy metal concentrations have been measured below Golden, indicative of mine shaft washouts and runoff from mining areas above the planning area.

5. Aquatic Habitat

Several fish collection studies done since 1975 indicate that diversity and numbers of fish in Clear Creek are significantly reduced compared to historical studies of Front Range streams reported from the early 1900's (Appendix, pp. 2-57 through 2-64). However, the species now missing include only minnows. Coldwater species such as trout have not been documented as occurring in Clear Creek below Golden, either in the past or present. Small numbers of stunted Largemouth Bass and Green Sun Fish, probably from nearby pit ponds, were collected in recent studies.

In terms of aquatic and streamside habitat, three general segments of Clear Creek can be defined based on present conditions, as follows:

a) Golden to Youngfield street - area of channelized and check-dammed stream subject to excessive flow fluctuations and poor submerged and riparian vegetation;

b) Youngfield to Wheat Ridge WWTP (at Marshall Street) - area of improved aquatic habitat and riparian vegetation with improved streamflow and more natural stream channel conditions; more suitable for warm water fish species;

c) Wheat Ridge WWTP to confluence with South Platte River - area of overall declining quality, silted streambed, and poor riparian vegetation; with measured toxic concentrations of unionized ammonia and residual chlorine, and very restricted streamflow at several points.

Since 1978, the Colorado Division of Wildlife, (CDW) as part of an overall program to create urban fisheries, has advocated the establishment of fisheries in Clear Creek. Channel Catfish, widely accepted as a game fish in the central and southern U.S., have already been stocked in small numbers in Clear Creek from Youngfield east through Wheat Ridge. Also, CDW is interested in establishing the Creek Chub as an acceptable panfish.

6. Agricultural Lands

At present, agricultural lands within the Clear Creek Basin are generally smaller than five acres and consist mainly of horse pasture, hay and alfalfa, nurseries, and truck gardens. Larger parcels located in the area between Easley Road and McIntyre Streets, western Adams County, and north of Arvada support a variety of agricultural uses (Appendix p. 2-74). Irrigation ditches originating from Clear Creek serve most of the lands in the basin. Examination of land use plans of DRCOG and local planning agencies, however, indicate that most agricultural parcels in the Clear Creek Basin will convert to urban uses in the future. However outside DRCOG's future urban service area boundary, in the area west of Indiana Street and north of Golden, agricultural and open space uses are promoted.

Water from Clear Creek is diverted to irrigate comparatively larger tracts and total acreages outside the Clear Creek Basin north of Arvada in the Big Dry Creek Basin and in Adams County north of the mouth of Clear Creek along the South Platte River. Clear Creek water diverted through Church, Farmers Highline, and Croke Canals and stored in Standley Lake serves much of the Big Dry Creek Basin agricultural lands. Colorado Agricultural and Clear Creek and South Platte Ditches serve Adams County lands. Much of the Adams County lands lie outside the DRCOG future urban service area boundary; however, Big Dry Creek Basin is subject to extensive urban development by the cities of Arvada, Northglenn, Westminster, and Broomfield. Much of the Adams County irrigated agricultural land is located within floodplain zones and may never be developed. Significantly, some of the Adams County lands served by Clear Creek water are considered Prime Agricultural Lands.

IV. ENVIRONMENTAL CONSEQUENCES

The evaluation in this section parallels the organization in Section III. Environmental impacts of the proposed Metro Clear Creek Interceptor project are described in each of the following subsections:

A. Corridor Location Impacts
B. Regional Impacts
C. Wastewater Treatment Systems Impacts

In subsection C, the combined effects of the proposed Metro Interceptor and the Golden/Coors plant are evaluated, drawing upon analyses presented in the Technical Report Appendix.

A. CORRIDOR LOCATION IMPACTS

1. General Construction Impacts

The direct effects of construction activities on the route environment which will or could occur include noise, blowing dust, disruption of traffic, erosion, stream siltation, disruption of agriculture, habitat destruction, and inadequate disposal of clearing debris and construction wastes. The very short-term nature of pipeline construction alone will limit most of these effects.

Erosion and stream siltation will be limited by developing the pipeline routing to fit drainage patterns and topography, avoiding trees and surface vegetation, minimizing exposed area, diking and berming exposed areas into stabilized diversion routes, sedimentation ponds, if necessary, and providing temporary cover for topsoil stockpiles in other areas of critical erosion hazard. Critical erosion hazard areas will include the points along the route where construction will occur extremely close to Clear Creek and at the Ralston and Clear Creek crossings. In all areas, revegetation of the route will be carried out as soon as possible after completion of construction, including regrading, restoration of soil fertility, seeding, and mulching. With proper controls, impacts on aquatic habitat will be short-lived if they occur at all (Appendix Section 4.5.1, pp. 4-27 and 4-28).

Improper erosion control and site restoration could cause destruction of aquatic habitat in Clear Creek; important habitat areas are discussed in more detail below (Section IV, C) and in the Appendix (pp. 4-28 through 4-31). Besides the measures outlined above, erosion, siltation, and water quality control in areas of construction within "waters of the United States" will further be provided under terms of an EPA/Corps of Engineers Section 404 Dredge and Fill Permit, which will be required prior to construction. Terrestrial habitat is considered less important since most of the route will follow previously disturbed areas. However, landscaping will be necessary along vegetated easements, in developed parklands including Prospect Park west of Kipling, and the Wheat Ridge Greenbelt area, in particular.

A low level of noise, blowing dust, and traffic disruption will be unavoidable in construction areas. However, dust will be suppressed by watering of dry, dust-prone areas such as access roads and spoil piles, and traffic will be controlled to limit delays, disruption, and hazards. Construction will be conducted during regular working hours to lessen the impact of noise. Construction debris will be disposed of in suitable disposal areas and transported in vehicles designed to prevent spillage. The health and safety of the public will also be a consideration due to unavoidable hazards posed by the construction site, especially in residential areas, including the following segments of the route:

a) West of No. Washington Street near Mapleton High School;
b) West of Sheridan near a mobile home park;
c) 52nd Avenue near Harlan;
d) Near Wadsworth;
e) Near 46th Avenue; and
f) East of Kipling near subdivisions.

Practices such as marking, barricading, and fencing trenches, locking machinery, and providing guards or police surveillance during non-work hours will limit the risk of safety.

Another direct effect peculiar to construction of wastewater treatment and conveyance systems involves disruption of normal operations during construction. At several points along the interceptor, the existing pipeline will be tied-in or relocated, requiring temporary conveyance techniques to maintain the normal flow of raw wastewater in the existing line. Temporary pipelines and pumping stations will ensure that no spillage or overflow to surface or ground waters will occur.

Disruption of agricultural activities is apt to occur in several areas along the interceptor route, including:

a) Franklin to York Streets;
b) Washington to Downing Street;
c) Pecos to I-25
d) Tennyson to Lowell Boulevard; and,
e) West 50th to West 48th Avenue.

Whether disruption of crops actually occurs will depend on the timing of construction in these areas, but can be minimized by the diligence of property owners in keeping abreast of shifts in scheduling.

The other subcategory of direct effects involving commitments of resources to construction include pipeline materials (piping, concrete, manhole covers, etc.), energy consumed by construction equipment in the form of fuels and lubricants, and manpower. As is generally true with pollution control projects, resource commitments will be outweighed by the long-term benefits to public health and water quality. Although total air pollutant emissions by fuel consumption will be low, aesthetic degradation of air quality associated with diesel exhaust will exist on a very short-term basis in any given area. The commitments of resources will be limited by optimizing the routing along the I-76 corridor and combining existing and future flows in the interceptor in sections where the existing pipeline will be relocated. The Colorado Division of Highways has agreed to coordinate its I-76 routing and design activities with those for the interceptor, within funding and scheduling constraints.

2. Floodplains/Wetlands Impacts

Construction of the interceptor will occur within the 100-year floodplains of Ralston and Clear Creeks and the South Platte River at numerous locations along its route. However, none of the pipeline components will be subject to damage due to flooding, nor will they encroach upon or restrict the floodway. Control for the relocated meter station will be located above the 100-year flood elevation to protect electrical and mechanical components. In most instances, construction will not physically disrupt wetland-type areas, but only cause disturbance due to noise, dust, and traffic. However, in the area between Sheridan Boulevard and Lowell Boulevard, the interceptor as now planned will require filling of about 2.4 acres of a pit pond just west of Tennyson Street adjacent to presently active gravel mining operations. This part of the route follows the proposed I-76 right-of-way, which will take lands containing numerous ponds. The impact of loss of 2.4 acres of pit pond in an industrial zone is not considered significant.

Stream crossing construction will be conducted in a manner which will avoid significant adverse impacts on general aquatic and waterfowl habitat. The measures described under General Construction Impacts for erosion and siltation control will be utilized. In addition, the provisions of a Section 404 Dredge and Fill Permit will be applicable, which include a supplementary environmental assessment and review of construction methods. These measures will assure that wetland/aquatic habitat impacts are minor and short-term.

3. Archaeological/Historical Resources

The State Historical Society of Colorado has been notified regarding the proposed interceptor project and determined based on complete review of the Clear Creek Facility Plan documents that "no properties possessing architectural or historical value will be affected by the proposed construction." No correspondence has occurred between the Metro District and the State Archaeologist concerning impacts on archaeological artifacts.

The possibility exists that interceptor construction could affect archaeological artifacts along the Clear Creek corridor. For this reason, an archaeological survey will be required during Step 2.

EPA will require that construction specifications prepared during Step 2 contain a clause requiring stoppage of construction activities if archaeological resources are uncovered, immediate notification of EPA and the State Historic Preservation Officer (SHPO), and rapid determination by the SHPO of the disposition of those resources. If warranted by a pre-construction archaeological survey of the route, a resident archaeologist may be assigned to the construction project.

4. Recreation Impacts/Potential

The primary opportunity for recreational use of the proposed interceptor right-of-way appears to be for a horse trail, due to the existence of a hiking trail and bikeways in the corridor. Such a trail would be most feasible between Youngfield and Kipling Streets, an area within the jurisdiction of the City of Wheat Ridge. The implementation process involved, were the city to be interested in a horse trail, would require cooperation between Metro District and the city, with Metro District making application for EPA Section 201 funding for design and construction funds (except for topcoating, which is not an allowable EPA expense) and with the City of Wheat Ridge performing much of the design work and providing the local 25 percent matching share. Funding for topcoating the trail could come from the city's general funds, Jefferson County Open Space, the State Parks and Outdoor Recreation Division (if funds become available), or the Heritage Conservation and Recreation Service. Successful implementation of a horse trail would, however, hinge on cooperation between Metro District and the City of Wheat Ridge.

A significant program for enhancement of recreational opportunities has been undertaken by the Colorado Department of Highways in its planning and design of the segment of Interstate 76 between I-25 and Wadsworth Boulevard. A major recreational trail will be incorporated into the I-76 right-of-way in this segment. Metro District will coordinate its efforts with the Highway Department both in the design of the interceptor adjacent to the planned highway and to assure maximum cooperation in trail planning. Opportunities may exist for trail extension to the east beyond I-25 along the interceptor route to the South Platte River, depending on the final interceptor alignment.

B. REGIONAL IMPACTS

EPA has identified issues regional in scope common to all ten facilities plans under review including the Clear Creek Facility Plan. These facilities planning proposals have been developed in conjunction with DRCOG's Clean Water 208 Plan for the five county metro area.

Identification of these issues resulted from an environmental impact statement process completed by EPA, which evaluated the cumulative region-wide effects of the ten projects and Clean Water Plan. The findings of the Final EIS resulted in a set of policies and policy implementation actions designed to allow federal funding of wastewater facilities projects while avoiding adverse regional impacts and fulfilling the content and intent of the Clean Water Act. The regional issues identified include the following:

1) Air Quality
2) Water Quality (Stream Classifications)
3) Wastewater Facilities Siting and Treatment Processes
4) Management and Institutional Arrangements
5) Control of Non-Point Source Pollution
6) Maintenance of Stream Flows
7) Water Conservation
8) Energy Conservation

9) Protection of Environmentally Sensitive and Resource Areas
10) Enhancement of Recreational Opportunities
11) Funding of Wastewater Collection and Treatment Facilities for Northern Douglas County
12) Development in the Vicinity of the Rocky Flats Plant

EPA's policy on each applicable regional issue and definition of grantee responsibilities are stated briefly in the following paragraphs. Grantee responsibilities which will be stated as grant conditions in Step 2 and Step 3 grants for the Clear Creek project are presented in Section V B below. More details of EPA's policies on regional issues are contained in the EPA Final Action document referenced in Section VII.

With regard to air quality, funding of wastewater facilities should be provided only where reasonable actions are being taken to deal with the air quality impacts of growth. Therefore, EPA requires commitments by local governments to be served by expanded wastewater facilities to support implementation of the Denver element of the State Air Quality Implementation Plan (SIP). Also, wastewater facilities must be designed using DRCOG population projections (or SIP revisions) and staged in accordance with EPA's April 25, 1978 regulations. Also, grantees must develop a program to manage wastewater facility capacity consistent with DRCOG 1980, 1990, and 2000 population forecasts. In addition, all new developments served by federally funded projects must be within adopted urban service area boundaries established by DRCOG and contiguous to existing developments.

On April 1, 1980 EPA published in the Federal Register an advance notice of proposed rulemaking to implement section 176(c) of the Clean Air Act. The notice describes a regulatory approach which provides that:

* States will establish procedures for the review of federal conformity determinations as a part of their state implementation plans (SIPs)

* Federal departments will establish procedures for determining the conformity of their actions with SIPs.

The federal departmental responsibilities may generally be satisfied by the use of existing notification and review procedures such as this EIS. Because the rulemaking may take almost one year to complete, EPA and other federal departments will establish interim procedures for determining the conformity of federal actions to approved and promulgated SIPs. Each agency including EPA must ensure that their environmental documentation to meet the procedural requirements of the National Environmental Policy Act will contain sufficient information to make the following findings:

1) All necessary state and federal air quality permits have been obtained for the activity. If a state variance has been issued, then it must be in conformity with the requirements of the Clean Air Act;
2) All population projections provided in the supporting data base for the action are consistent with the population projections used in the SIP;
3) The stationary, area and mobile source emission growth rates that are provided in the supporting data base for the action are consistent with the emission growth rates used in the SIP;
4) The increased emissions resulting from the action do not conflict with the emission reduction requirement of the SIP;
5) The increased emissions resulting from the action do not exceed the area's increment for the prevention of significant deterioration of air quality;
6) The increased emissions resulting from the action do not contribute to the violation of any national ambient air quality standard;
7) The action is consistent with all the transportation control measures that are provided for the SIP; and
8) The action complies with all other special provisions and requirements of the SIP.

EPA has reviewed the Clear Creek Watewater Facilities Plan and finds that it conforms with the Colorado State Implementation Plan

(SIP) in accordance with Section 176(c) of the Clean Air Act. Before EPA makes a final conformity determination and proceeds with project funding, the formal views based on review of this document by the Colorado Air Quality Control Commission and the Denver Regional COG will be carefully considered as well as those views of the public. EPA believes that funding of the Clear Creek project conforms with the Colorado State Implementation Plan (SIP) on the following basis:

Determination Requirements defined above from the Advance Notice of Proposed Rule Making Federal Register, April 1, 1980.

Discussion of Finding

1. The proposed facility will not require State or Federal air quality permits for operation, because it does not emit materials during operation that contribute to standards violations. Construction Emissions Permits for Fugitive Dust specifying control measures will be obtained by the Metro District from the Colorado Air Quality Control Division as a condition of approval for step III.

2., 3., 4., 6., 7., 8. The proposed growth to be supported by this project is reflected in the DRCOG Regional Growth and Development Plan (RGDP) which formed the basis for all analytical work in the SIP. The size of the wastewater interceptor in the facilities plan is based on the 1976 DRCOG population projections for the Clear Creek Basin in the RGDP. Thus, the projections of future air quality and the analysis of controls in the SIP account for the increase in auto emissions over the time that are associated with higher residential population in this portion of the Denver Metropolitan area. EPA will require as a grant condition that the Metro District develop a program with its member Districts and municipalities in the Clear Creek Basin to manage wastewater facility capacity consistent with DRCOG 1980, 1990 and year 2000 population forecasts. The Metro District has indicated that they are considering sizing the Clear Creek interceptor to handle the ultimate projected flow from the Clear Creek Basin. EPA will fund this project according to its 20-year cost-effective criteria. The exact proportion of EPA-fundable costs will have to be determined through subsequent analysis. Attachment C described the steps that will have to be taken to complete such an analysis. A NEPA analysis will also have to be performed with particular attention paid to conformity between the population projections used and the SIP projections. For these reasons, EPA believes that considerations under section 176(c) have been met.

5. Not applicable in nonattainment areas.

EPA has also adopted the following criteria for evaluating wastewater facility siting issues:

1) Processes must provide in-stream flow and quality benefits so that NPDES permit limits and other enforceable Clean Water Act requirements are met;
2) Facilities must have State 208 plan and local endorsement;
3) Strong preference will be given for land treatment/re-use systems;
4) The cost-effective facility must be identified to establish the EPA funding level even if there are compelling reasons to implement another plan; and,
5) Facilities must conform with other EPA, state, and local requirements relating to water rights, recreation, water supply, and the environment.

EPA has established several requirements which pertain to control of non-point source water pollution as specified in DRCOG's Clear Water Plan. For their part, local governments in service areas receiving grant funds must show progress toward implementing the non-point source controls recommended in DRCOG's Clean Water Plan. This includes the adoption of an erosion control ordinance for preventing non-point source pollution from new construction activities.

EPA has established several actions to address the issue of streamflow depletions. These include further consideration in the Clean Water

Plan of the cumulative effects of wastewater treatment projects, changes in water supply requirements and supply methods; evaluation of stream flow impacts in each facilities planning project; consultation with the Colorado Department of Natural Resources, Parks and Outdoor Recreation Division and Wildlife Division to determine the significance of identified stream flow changes on recreation and wildlife resources; and consultation with the State Engineer where a water rights dispute may be involved, with assurances that dispute can be settled prior to providing construction funds.

EPA has taken several measures to encourage year-round conservation of water used in the home. Prior to making grants for wastewater facilities design, grantees will have to demonstrate that:

1) metering and pricing incentives have been studied and steps taken to implement these measures if cost-effective;
2) building codes have been evaluated to incorporate water-saving devices in new construction, where feasible, and programs instituted to encourage voluntary retrofitting;
3) capacities of proposed facilities reflect projected water savings; and,
4) water conservation planned and implemented where dry weather wastewater base flow (less industrial contributions) exceeds 70 gallons per capita per day; in-house water conservation programs should yield 15 percent reduction in flow.

To encourage energy conservation at wastewater facilities which may have the additional beneficial effects of reducing costs and improving system reliability, EPA requires that solar energy and energy conservation technologies be considered to achieve maximum energy efficiency. EPA also encourages consideration of innovative growth patterns which increase overall community energy efficiency.

EPA has established a policy to protect environmentally sensitive areas defined in the DRCOG Regional Growth and Development Plan.

Federal funding for wastewater facilities projects which directly or indirectly affects environmentally sensitive areas identified in the DRCOG plan will be restricted unless the sensitive areas cannot be avoided and impacts are mitigated. EPA will use existing DRCOG project review processes to aid EPA in determining whether a project is consistent with DRCOG policies on environmentally sensitive areas.

EPA supports the DRCOG policy which recommends against development in the 100-year floodplain. EPA will require documentation from the grant applicant concerning local floodplain protection programs.

EPA will rely on consultations with the State Historic Preservation Officer, field surveys and construction monitoring to protect cultural resources. Requirements for ensuring that wastewater facility locations and design are compatible with and enhance recreational opportunities will be handled by DRCOG and State A-95 reviews. Also, EPA plan reviews will determine if the potential for recreation and open space opportunities have been incorporated into facilities planning.

Wastewater facilities funded by EPA can only serve developments located in the "Area of Concern" established by the Colorado Department of Health for possible radiation contamination from the USAEC Rocky Flats Plant if adequate mitigating measures are taken. Otherwise, grants will be conditioned to prohibit service to such developments. Also, residents within the vicinity of Rocky Flats must be notified of the provisions of the State Radiological Emergency Response Plan. Certain areas within the Clear Creek Basin will have to demonstrate compliance with the notification provisions of this policy as a condition for step II approval.

C. WASTEWATER TREATMENT SYSTEMS IMPACTS

1. In-Basin Plants Impacts

The proposed interceptor project will have the effect of making closure of the Arvada, Clear Creek Valley, and Wheat Ridge plants a favorable alternative for the local governments which own and operate those plants. Other influences, discussed in Section III, on plant closure include the proposed state water quality standards, which would nearly assure closure, and future local plans for wastewater reuse in which the plants may remain open but may not discharge directly to Clear Creek.

If one or more of the in-basin municipal plants close, direct streamflow effects will occur. Obviously, the greatest effect would occur if the largest plant, Wheat Ridge at 2.5 MGD capacity, closed. Capacities and present average flows were given in Section III. B. It has been assumed that all the plant flows would be at or near full capacity by year 2000 if they remain open. The secondary streamflow effects of closure are discussed in the sections below.

The plant to be used by Golden and Coors for municipal wastewater treatment (alluded to in Section II. D) will be operated beginning in 1981 or 1982 by Coors. This plant will contribute additional flow to Clear Creek at McIntyre Street, since Golden and Coors municipal wastewater is now discharged to the existing Metro District interceptor. Initially, average discharge will be about 2.15 MGD or 3.32 cfs, increasing to about 3.00 MGD or 4.62 cfs in the year 2000. However, during winter months, flow will be discharged to Croke Canal, as is now done with Coors process wastewater effluent. Streamflow effects of the Golden/Coors plant were included in the analysis of flow-related impacts reported below to give the overall picture of wastewater facilities impacts in the Clear Creek Basin.

2. Water Rights Impacts

As in the affected environment analyses, the determination of water rights impacts associated with the proposed Clear Creek Interceptor is divided into assessments of winter (November through March), runoff (April through July) and late irrigation (August through October) seasons. An operations study has been done on Clear Creek using the changed WWTP discharge conditions anticipated in the future with the project (Appendix pp. 4-4 through 4-7). Historical diversion records were used in the operations study, after an assessment of future changes in diversion patterns yielded no quantifiable, significant differences. The operations study produced call patterns for representative months during the three seasons for the hydrologically dry year of 1977. Analysis of these patterns, changed WWTP flows, streamflows and diversion records resulted in identification of ditches affected by the project.

During the winter season, call patterns and project effects are quite simple. The Croke Canal exercises its 1902 water rights for transport of Clear Creek water to Standley Lake throughout the period, drying up the creek and taking all of the new Golden/Coors plant flow. The Fisher Ditch diverts water below where the three existing WWTP's presently discharge, but flow calculations for January, 1977 indicate no injury to Fisher Ditch, even if the three plants close.

Call patterns are more complex for the runoff and late irrigation seasons, requiring analysis of daily diversion records for several ditches. The effects of the proposed project are illustrated in Table 5 for conditions with the Wheat Ridge, Arvada, and Clear Creek Valley plants both operating and abandoned. The analysis showed that Fisher, Clear Creek and Platte River, and Colorado Agricultural ditches are adversely impacted by the Clear Creek Interceptor project if the existing municipal WWTP's close and transfer their flows to the Metro District interceptor for treatment at the Central Plant. Effects on other ditches will not be significant.

3. Streamflow Impacts

Effects of the proposed project on Clear Creek streamflows were analyzed for the winter, runoff, and late summer/fall irrigation seasons, using the results of the operations study described in Section C.2. The winter season will result in roughly the same future streamflow conditions with the project as at present in the reach above the Wheat Ridge WWTP. Croke Canal will absorb increased discharges of the Golden/Coors plant. If the Wheat Ridge, Arvada, and Clear Creek Valley WWTP's close, flows will drop below the assumed critical low flow of 3 cfs in a less than one mile reach below the Fisher Ditch at Lowell Boulevard.

TABLE 5

WATER RIGHTS IMPACTS

Affected Ditch	Relative Effects on Existing Diversion			
	Runoff Season		Late Irrigation Season	
	WWTP's Open	WWTP's Closed	WWTP's Open	WWTP's Closed
Slough Association	0	0	+	+
Fisher	0	0	+	–
Lower Clear Creek and Platte River	+	–	+	–
Colorado Agricultural	+	–	+	–

Key: + = diversions increase due to project
– = diversions decrease due to project
0 = no effect
WWTP = Wheat Ridge, Arvada and Clear Creek Valley Wastewater Treatment Plants

During the runoff season, Croke Canal does not divert and flow is augmented by essentially the total discharge of the Golden/Coors plant in the reach between McIntyre and Wheat Ridge WWTP. If the three WWTP's remain open the augmented reach will extend all the way to the Clear Creek and Platte River Ditch (CCPRD) headgate about one-third mile east of Pecos Street. If the WWTPs close, flows will be depleted in the Wheat Ridge WWTP to CCPRD segment. However, due to the high natural flows entering the basin and calls for water from the mainstem South Platte River, flows will not drop below the assumed critical level in the Clear Creek Basin. Minimum flow, occuring just below the CCPRD headgate, will be above 16 cfs.

During the late irrigation season, lower natural streamflow and a complex series of calls for water by ditches with various water rights priorities produce differing flow impacts in various segments of Clear Creek. Table 6 shows these effects for several points along Clear Creek, based on September, 1977 calculations. Major adverse streamflow impacts will occur in the reach of Clear Creek between the Wheat Ridge WWTP at Marshall Street and the CCPRD if the three existing in-basin plants close. Flows in the reach between the Wheat Ridge WWTP and the CCPRD will be substantially reduced, as evidenced by the Ralston Creek and Pecos Street flows. In the reach from the Golden/Coors WWTP discharge point to the Wheat Ridge WWTP, flows will be augmented somewhat, although increased diversions at Slough Ditch will negate some of this gain from Youngfield Street downstream. Flows above McIntyre and below the CCPRD headgate one-third mile east of Pecos will be unaffected by the proposed project.

4. Water Quality Impacts

Water quality impacts in the Clear Creek Basin will be both project related and in the form of general problems associated with pollution control in the area. Impacts not specific to the proposed project include non-point source pollution chiefly in the form of urban runoff, and also agricultural runoff and groundwater seepage from abandoned landfills in the floodplain. Also, metals pollution from mine drainage

TABLE 6

YEAR 2000 STREAMFLOW IMPACTS OF CLEAR CREEK INTERCEPTOR PROJECT[1]

(all in CFS)

Point on Clear Creek	Plants Open		Plants Closed	
	Total Flow	Change from Existing Situation	Total Flow	Change from Existing Situation
Below McIntyre (at Golden/Coors Discharge)	13.61	+4.62	13.61	+4.62
Youngfield Street	3.33	+1.89	3.83	+2.39
Wadsworth Boulevard	3.15	+1.89	3.65	+2.39
Just above mouth of Ralston Creek	11.24	+3.18	3.26	-4.80
Tennyson Street	11.60	+3.18	2.37	-6.05
Lowell Boulevard (Just below Fisher Ditch)	4.00	1.28	0	-2.72
Derby Gauge (At York Street)	2.30	0	2.30	0

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(1) Based on September, 1977

upstream of Golden influences water quality. Urban runoff is expected to become an increasing problem especially in the reach of Clear Creek from Kipling Street to Sheridan Boulevard, due to continued urbanization while mine drainage pollution may be abated due to reclamation plans to be implemented by the Colorado Mined Land Reclamation Board. These improvements should help abate metals pollution detected on Clear Creek below Sheridan Boulevard. Another possible influence on metals pollution, abandoned landfills in the reach east of Sheridan, are not well defined as pollution sources.

The impacts on Clear Creek water quality specific to the proposed project involve pollutant discharges and streamflow effects of WWTP's. In previous sections, changes in streamflow resulting from opening of the Golden/Coors municipal WWTP (augmentation) and closure of the three in-basin municipal WWTP's (depletions) between Marshall Street and Sheridan Boulevard have been identified. Augmentation of Clear Creek flow will not occur in the winter below the Croke Canal. Thus, in the winter, depletions caused by closure of Wheat Ridge, Arvada, and Clear Creek Valley WWTP's will both cause low flows less than 3 cfs and will eliminate significant sources of fecal coliform, chlorine, ammonia, BOD, and nutrients. Improvements in overall water quality will depend on the ability of local governments and DRCOG to control and reduce pollution from groundwater returns and urban runoff which will be the major although intermittent pollution sources. However, chlorine and ammonia, pollutants peculiar to WWTP discharges, will be all but eliminated during the winter. If the plants stayed open, ammonia and chlorine could be reduced by plant upgrading, but would still be potential problems by their presence below Marshall Street.

Discharges planned for the Croke Canal/Standley Lake system during winter from the Golden/Coors plant may have an adverse effect on that water supply. However, systematic studies of the lake system would be necessary using proposed discharge quality standards (when available) and detailed limnological data in order to determine if there will be significant impacts.

In the summer/fall irrigation season both augmentation and depletions of streamflow will have an impact on water quality. During the lowest flow months of August through October both the Golden/Coors WWTP flows and increases in Coors process WWTP flows will make sewage effluents a much higher percentage of total streamflow than is the case at present between McIntyre and Marshall Streets. Very stringent discharge standards will be required to maintain water quality adequate for a warm water fishery. Ammonia, total nitrogen, and phosphorus will be new problem pollutants due to the Golden/Coors municipal WWTP, since the Coors process WWTP effluent has very low nutrient contents.

Very recent Colorado Water Quality Control Commission actions indicate that only secondary treatment may be required on Front Range streams. If this were the case, the effects of Coors and Golden/Coors plant discharges may be significant on the most favorable segment of Clear Creek between Youngfield and Marshall Streets.

Closure of the three existing WWTPs will have the effect of substantially reducing nitrogen, phosphorus, and chlorine levels in the reach of Clear Creek below Sheridan. In the low flow season from August through October, this improvement may cause some improvement in the water quality for aquatic habitat. A Colorado Division of Wildlife representative has identified plant closures as a definite plus for aquatic life/fisheries in Clear Creek below Sheridan, despite the attendant loss of flow (see attached letter from Woodling). Overall quality will still depend on the success of controls on non-point sources.

Water quality for municipal water supply intakes will be improved by closure of the three existing WWTPs; however, volume of water available for certain intakes will be deleted. The Kershaw Ditch, which supplies water for the Crestview Water and Sanitation District, will receive improved quality water while avoiding the effects of flow depletion due to its senior water rights. More junior appropriations by Thornton and Northglenn will receive both the improved quality and depletion of flow effects on diversions through Fisher, Lower Clear Creek and Platte River, and Colorado Agricultural Ditches. The new Golden/Coors plant will have an adverse, although unquantified, effect on these water supplies, especially if the plant operates at secondary treatment.

In summary, the impacts of the project on water quality are considered mixed. A major beneficial effect will be removal of the three existing plants; however, susceptibility to quality degradation from other less easily controlled diffuse pollution sources will occur, which is considered an adverse impact.

5. Aquatic Habitat Impacts

Impacts of the proposed Clear Creek Interceptor on aquatic habitat due to streamflow and quality effects are presented in terms of the three habitat segments described in Section III.C.5., as well as the three hydrologic seasons. In the Golden to Youngfield reach, Segment I, critical low flows will remain below Croke Canal in the winter. Although flow augmentation due to the Golden/Coors plant will provide additional habitable space for fish below McIntyre Street during the runoff through irrigation seasons (April through October) and possibly allow the water's edge to approach streamside vegetation, excessive stream channelization will remain a major limitation in the perpetuation of a fishery. Also, in-stream water quality standards and discharge standards placed on the Golden/Coors plant will determine whether habitable conditions prevail in the augmented reach. Secondary effluent could adversely affect the present fishery.

In Segment II, from Youngfield Street to the Wheat Ridge WWTP, flows will be slightly augmented to just above the critical low flow of 3 cfs during the late summer/fall irrigation season (Table 6, Section C.3), regardless of whether the existing in-basin plants close or not. However, low flow conditions less than 3 cfs will still occur in winter.

During the lower flow conditions of the winter and late irrigation seasons, water quality will have a direct bearing on the ability of this segment to support a fishery. The influence of Golden/Coors

WWTP discharges will be somewhat reduced, as compared to Segment I, during the late irrigation season, since much of the effluent will be diverted by ditches in the lower part of Segment I. Non-point sources, especially urban runoff, will be the major influence on water quality, especially below Kipling Street. Control of loadings of nitrogen and phosphorus from urban runoff will be a key to maintaining a fishery in this segment.

In Segment III, from the Wheat Ridge WWTP to the South Platte River, a slight increase in flow will occur due to the project, if the existing WWTP's remain open, during the runoff and late irrigation seasons. If plants close, the combined effects of extremely low, even intermittent flows with nutrient loadings from urban runoff will make this reach uninhabitable. In this case, existing plants closed, ammonia and chlorine loadings would be greatly reduced from present conditions, but with only limited benefits to the segment, which is already of poor quality for aquatic habitat.

Overall, the proposed project will have mixed impacts on aquatic habitat. However, for Segment II, the highest quality aquatic habitat area along Clear Creek, enhancement or degradation will depend upon the success of efforts to control water quality impacts due to 1) the Golden/Coors plant and 2) urban runoff.

6. Agricultural Lands

Changes in the flow regime of Clear Creek brought about by the chosen Clear Creek Interceptor plan will have both positive and negative impacts on the future productivity and existence of agricultural lands. Increases in water available for diversion will be experienced by the Slough Association Ditch in the August through October season from Golden/Coors WWTP discharges, regardless of whether the existing in-basin plants close down.

If the in-basin plants close down, the Colorado Agricultural Ditch and Clear Creek and Platte River Ditch (CCPRD) will experience large losses during the early season. The Fisher Ditch and CCPRD will experience large losses in the late summer/fall irrigation season. Representative of these conditions are the calculated September diversion depletions of 38% and 43% for the Fisher Ditch and CCPRD for year 2000. Depletions at the Colorado Agricultural Ditch will be roughly the same as those of the CCPRD.

The Colorado Agricultural Ditch and CCPRD service roughly the same territory, including a small area of the eastern end of Clear Creek Basin north of Clear Creek and a much larger area northeast of the basin on the west side of the South Platte River north to Frederick, Colorado, in Adams County. Agricultural uses are for truck gardens, corn, wheat, hay, small grains, and vegetables. Some of the service area is considered Prime Agricultural Lands and a portion of the service area is owned by farmers not likely to cease operations for urban development. Some of the service area lies in floodplains and will probably never develop. Based on these considerations, loss of agricultural lands in Adams County as a result of the project is considered a substantial impact.

Although a substantial loss of irrigation water is expected for the Fisher Ditch (and United Water Company Ditch, which continues the Fisher Ditch service area east of I-25) in the extreme eastern part of the basin on the south side of Clear Creek, significant agricultural land impacts are not foreseen. Agricultural uses are for nurseries and truck gardens. However, none of these lands are considered Prime Agricultural Lands. None are in floodplains and the area is expected to undergo severe urban development pressure in the future.

V. MITIGATION MEASURES

A. CORRIDOR LOCATION IMPACTS

1. Construction Impacts (General)

General construction impacts as identified in Section IV.A will be mitigated by several routine construction practices, including: 1) scheduling construction in congested areas to minimize disruption of traffic; 2) several measures to avoid erosion and stream siltation; 3) watering for dust control; and, 4) providing adequate safety equipment and procedures, especially in residential areas. One special practice for this project will involve early notification of agricultural landowners along the right-of-way and easements so that damage of crops can be minimized.

EPA will require the Metro District to incorporate these mitigation measures in the design plans and specifications for the interceptor project. The Metro District will also be required to apply to the Colorado Air Pollution Control Division for a Fugitive Dust Emission Permit.

2. Wetlands Impacts

No designated wetlands have been identified in the Clear Creek Basin, although abandoned gravel pit ponds and the creek, itself, provide habitat for resident waterfowl populations. A minor loss of pit pond habitat has been identified based on the preliminary interceptor alignment, and may vary based on the final alignment. Significant loss of wetland-type habitat is not expected, however.

Stream crossing impacts on Clear Creek and its tributary, Ralston Creek, will be mitigated through adherence to construction practices which minimize the area of streambed disturbance, avoiding releases of excavated materials into the streams and riparian habitat, and minimizing time of interruption of flow. Also, construction of crossings will be timed to correspond with periods of low streamflow. Also, the crossings will be constructed in accordance with the terms and conditions of a

Section 404 Dredge and Fill permit, issued by the Corps of Engineers. Metro will be required as a grant condition to identify to EPA during step II design whether any wetland areas will be affected by interceptor construction. A wetland mitigation plan may need to be developed.

3. Cultural Resources Impacts

The Metro District will be required to perform an archaeological survey along the proposed pipeline route prior to step III. This survey can be performed at a point in time in the design process when the right-of-way has been specifically identified. Payment of Step 2 funds will be conditioned upon completion of this item. See Grant Condition No. 11 in Section B below.

4. Recreation Impacts

The Metro District will be required as a Grant Condition to check the most recent status of planning for the I-76 Interstate link with the Colorado Department of Highways to determine the possibilities for compatible recreational features. Also, Grant Condition No. 5 below deals with recreational resources. The Metro District will also be required to demonstrate recent coordination with local and county governments to determine whether the interceptor corridor will be integrated with other recreational features.

B. SECONDARY/REGIONAL IMPACTS

The Clear Creek Facility Plan falls under the policies adopted by EPA as a result of the Denver Regional Environmental Impact Statement (see Regional Impacts, Chapter IV). Multipurpose governments in the Clear Creek basin will be required to demonstrate compliance with these EPA policies. The multipurpose governments affected would be the cities of Westminster, Arvada, Wheat Ridge, Lakewood, Denver, Golden, and Jefferson and Adams Counties.

EPA will include the following conditions in the Step 2 grant to the Metro District:

Grant Condition 1

The Grantee shall submit documentation to demonstrate that the grantee, in conjunction with each local jurisdiction in the Clear Creek Service Area (Golden, Lakewood, Arvada, Wheat Ridge, Westminster, Jefferson County and Adams County) have developed and will implement a sewer tap program(s) designed to allocate the number of sewer taps available for new residential, commercial, and industrial development in the Clear Creek Service Area. The program(s) shall take into consideration the average annual needs of each local jurisdiction in the Clear Creek Service Area. The program(s) shall be consistent with the DRCOG population allocations for the Clear Creek Service Area.

Grant Condition 2

The Grantee shall submit documentation to demonstrate that the grantee and each local jurisdiction in the Clear Creek Service Area (Golden, Lakewood, Arvada, Wheat Ridge, Westminster, Jefferson County and Adams County) have agreed to prohibit direct or indirect (through pump station) sewerage connections to any interceptor sewer or treatment facility to be funded by this grant, where the sewage originates from any residential, commercial or industrial structure or facility located outside of any urban service area defined by the Denver Regional Council of Governments in the Regional Growth and Development Plan for the Denver region in effect on the date of this grant. This condition shall not apply to existing sewerage connections from residential, commercial, or industrial structures or facilities located outside of any urban service area defined by the Denver Regional Council of Governments in the Regional Growth and Development Plan for the Denver region in effect on the date of this grant. This condition shall not apply to existing sewerage connections from residential, commercial, or industrial structures in existence on the date of this grant and which are located outside of DRCOG urban service areas. Exceptions to this condition, must be negotiated with EPA on a case-by-case basis and must be approved by the appropriate local and state A-95 agency, and through any necessary modifications to DRCOG's Regional Growth and Development Plan.

Grant Condition 3

The grantee, in conjunction with each of the local jurisdictions in the Clear Creek Service Area (Golden, Lakewood, Arvada, Wheat Ridge, Westminster, Jefferson County and Adams County) shall provide EPA with documentation that the local jurisdictions in the Clear Creek Service Area have adopted appropriate ordinances or requirements to implement the non-point water pollution requirements included in the 208 Clean Water Plan adopted by the Denver Regional Council of Governments. Specifically, the grantee shall provide EPA with documentation that each local jurisdiction in the Clear Creek Service Area has adopted an ordinance or procedure to control erosion and sedimentation from new developments.

The grantee and the local jurisdictions mentioned above shall use the 208 Clean Water Plan and the following publication as evidence in developing appropriate non-point control ordinances or requirements:

A Guide for Erosion Control and Sediment Control in Urbanizing Areas of Colorado: Interim Guidance, prepared by the U.S. Department of Agriculture, Soil Conservation Service, Denver, Colorado, in association with the City of Aurora in 1977.

Grant Condition 4

The grantee shall use average daily base dry weather flows of 70 (seventy) gallons per capita per day or less in estimating wastewater flows to be used in designing the project features to be funded with this grant. In regard to wastewater flow estimates and flow reduction, the grantee shall comply with the cost effectiveness analysis guidelines, Appendix A, 40 CFR Part 35. In the event the grantee decides to use average daily base flows in excess of 70 (seventy) gallons per capita per day, the grantee shall submit an analysis of flow reduction alternatives as required in Appendix A, 40 CFR Part 35.

Grant Condition 5

The grantee shall submit documentation that the grantee has consulted with the local jurisdiction in the Clear Creek Service Area

(Golden, Lakewood, Arvada, Wheat Ridge, Westminster, Jefferson County and Adams County) to incorporate appropriate recreational features (for example, bike paths along interceptor routes) into the project to be funded by this grant. The grantee shall submit documentation that the grantee has consulted with the Colorado Department of Highways to co-ordinate recreational features between the interceptor sewer and the Interstate 76 highway segment.

Grant Condition 6

The grantee shall submit documentation that the interceptor sewer project to be funded by this grant is consistent with the environmentally sensitive area policies numbered 23 through 41 contained in the DRCOG Regional Growth and Development Plan.

Grant Condition 7

The grantee, in conjunction with each of the local jurisdictions in the Clear Creek Service Area (Golden, Lakewood, Arvada, Wheat Ridge, Westminster, Jefferson County and Adams County) shall provide EPA with documentation that each local jurisdiction in the Clear Creek Service Area has developed an effective program to control development within the designated 100-year floodplain. At a minimum, an effective program must comply with the floodplain management standards of the National Flood Insurance Program, including designation and regulation of the floodway. The grantee and local jurisdictions may wish to accept a sewerage connection from any residential, commercial or industrial structure located within a designated 100-year floodplain, if the structure is in existence or was issued a local building permit prior to the date of award to this Step 2 grant.

Grant Condition 8

Service agreements with jurisdictions connecting to Metro District member municipalities must be completed or substantially completed and must reflect any financial capital cost arrangements and indicate agreement by those jurisdictions to enforce the federal requirements for equitable users charges, industrial cost recovery, if any, and sewer use ordinances as contained in 40 CFR Part 35. In addition, each jurisdiction must agree to institute sewer system rehabilitation measures when the Metro member deems that excessive infiltration or inflow is occurring in the sewerage system.

Grant Condition 9

The grantee is hereby advised that EPA will not award a Step 3 grant until the grantee has complied with grant conditions 1-8 above.

Grant Condition 10

The grantee is hereby advised that the EPA Regional Administrator may withhold, condition, or restrict the Step 3 grant in the event that he determines that the provisions of Section 316 (b) of the Clean Air Act of 1977 have been met.

Grant Condition 11

The grantee is hereby advised that for Step 3 construction, provision must be made for identifying the significance of any archaeological artifacts unearthed during construction. This could include hiring of a qualified archaeologist to monitor construction activities. If archaeological artifacts are unearthed, construction will be halted and the State Historic Preservation Officer will be consulted immediately. Accommodations will then be made as necessary for excavation and assessment of uncovered archaeological resources.

Grant Condition 12

The Grantee shall provide evidence of adoption of ordinances dealing with prospective developers in the Rocky Flats' "Area of Concern" defined by the Colorado Department of Health for those multi-purpose governments lying within the service boundaries of Clear Creak Basin. Further the grantee must have agreed to apply such an ordinance to any new area annexed in the future to these cities lying in the "Area of Concern". This ordinance shall include the requirements for soils testing, etc., defined by Colorado Department of Health through County Subdivision regulations. Award of Step III grant will be contingent upon satisfactory compliance with this provision or deletion of treatment capacity for the area of concern from grant eligibility.

C. SYSTEM TREATMENT LEVEL AND OPERATION

EPA can define a number of goals in both the Clear Creek study effort and this Environmental Assessment that it would like to see implemented for Clear Creek. The goals are as follows:

1) The provision of adequate wastewater treatment for Clear Creek Basin.
2) The maintenance and improvement of aquatic life/habitat on the Creek.
3) Protection of significant agricultural lands served by Clear Creek water.
4) Protection of existing water rights.
5) Protection of the quality of municipal water supplies derived from Clear Creek.
6) Minimization of wastewater treatment costs to Clear Creek inhabitants.

It should be recognized that all of these goals may not be simultaneously achieveable. In order to obtain goals 1 through 5, goal 6 might not be achieveable, and so forth. From the study effort by Dames & Moore, EPA can project a likely set of present trends for Clear Creek with the proposed course of action. These include a greater, more dense population, elimination of most agricultural lands in the service area, continued conversion of agricultural water rights to municipal and industrial rights, movement of most of the municipal water withdrawals to the upstream area around Golden, and a gradual and continued deterioration of water quality, aquatic life habitat, and recreational potential along Clear Creek in this stretch. This is not to say that certain improvements are also not likely to occur. Certainly upstream mine drainages and landfill leaching could be cleaned up. It just appears on the balance that the present trend suggests a Clear Creek not too much different than today.

The new Metro interceptor and the elimination of the three satellite plants have been projected as somewhat improving water quality but at the expense of water quantity. The Golden/Coors plant by contrast may deteriorate quality in certain stream segments, but add flow back to the stream. It does not appear that any or all of the combinations considered here can materially improve water quality and aquatic life potential in this stretch of Clear Creek nor substantially change the water quality for municipal purposes. Agricultural lands will still be subject to conversion, with lands near the mouth of Clear Creek being the lands most affected by upstream changes in water supply.

In order to better achieve some of the above-defined goals, the Dames & Moore report suggested the following possible mitigation measures:

1) Inclusion of other native water flows (perhaps from the Metro District into the Golden/Coors plant) to enhance creek flows.
2) Pumping back of Metro effluent to some point in Clear Creek to protect lower Clear Creek water rights.
3) Change to more stringent stream standards to enhance water quality protection for municipal water supplies and aquatic life.
4) Change to less stringent stream standards to enhance water quantity for municipal, agricultural and aquatic life uses.
5) Purchase of water rights to maintain some flows in the stream at all times.
6) Transfer municipal water supply points of diversion downstream to maintain water in Clear Creek.

EPA recognizes that these kinds of mitigation measures are not unilateral measures that could be taken by any one agency or municipality, particularly not EPA. It appears that if the first five goals defined above are important enough to Clear Creek communities, some form of coordinated and cooperative measures will have to be taken. EPA would be willing to assist in any way it can to help implement these measures. For the present, however, EPA will not require any mitigation measures of the kind discussed above.

EPA will require the following grant condition: Before the grantee (Metro District) accepts the flows from any of the three wastewater treatment facilities now operating on Clear Creek, the grantee shall give notification of such action to each of the holders of vested water rights downstream on Clear Creek. In the event that material injury is shown by the holders of such vested water rights, the grantee must demonstrate that any one of the following actions have been taken:

1) An agreement between Metro, the discharging entities and the parties whose water rights are affected that resolve any issues between them.
2) A court approved plan of augmentation.
3) Some other action that will satisfy the requirements of Articles 80 to 93 of Title 37, C.R.S. 1973 and Colorado court decisions with respect to the determination and administration of water rights. These provisions define the way water may be appropriated and used in Colorado and include regulation of transfers of water rights from one location to another, plans for augmentation and instream flow rights, as well as other factors which may be of particular significance to the water rights issues associated with construction and use of the new Metro interceptor.

VI. PUBLIC PARTICIPATION

During the months of October and November, 1976, 186 copies of the Clear Creek Facility Plan Phase 1 Report were distributed throughout the region. Each Director of the Metro Sewage District Board received a copy and most of the other copies went to individuals and organizations believed to be important to the selection process. Many of these reports were transmitted by letter. All of the letters requested comments on the wastewater management alternatives presented in the report by December 6, 1976.

Special meetings were held with individuals and organizations with the most obvious interest in the project. At most of the meetings with those agencies, a slide and lecture presentation was made. The purpose of the meetings was to explain the study, answer questions, receive comments, and aid the audience in developing a position on the alternatives.

On November 11, 1976, a public meeting was held in the Arvada Municipal Building. The meeting was well advertised. Approximately 800 brochures were also distributed. The meeting consisted of a slide and lecture presentation, questions and answers, and two questionnaires. It is estimated that about half of the approximately 30 people who attended the public meeting were affiliated with the Metro Sewage District or one of its member municipalities. The other participants were citizens of the basin primarily desiring more information. It is hoped that the views expressed at the meeting were representative of all the residents in the basin.

Numerous organizations have submitted written comments in response to the Phase 1 Report. As a result of the special meetings, public meeting, and written comments, the following major concerns have been identified:

1) a general desire to maintain flow in Clear Creek;
2) a need to protect the quality of water in Clear Creek suitable for domestic raw water;
3) a concern for the effect on the neighborhood adjoining a new treatment facility; and
4) a desire to discharge treated wastewater into Clear Creek for purposes involving water rights.

VII. REFERENCE DOCUMENTS

1. CH2M Hill, Inc., Clear Creek Facility Plan, Phase I Report, for Metropolitan Denver Sewage Disposal District No. 1, (MDSDD) September, 1976;
2. CH2M Hill, Inc., Clear Creek Facility Plan, Phase I Report - Supplement, for MDSDD, December, 1976;
3. CH2M Hill, Inc., Clear Creek Facility Plan, Final Report, for MDSDD, August, 1977;
4. Leonard Rice Consulting Water Engineers, Inc., Water Rights Impacts of Clear Creek Facility Planning, for MDSDD, December, 1978;
5. USEPA, Region VIII, Denver, Final Action on the Denver Regional Environmental Impact Statement for Wastewater Facilities and the Clean Water Program, August, 1978;
6. USEPA, Region VIII, Denver, Final Denver Regional Environmental Impact Statement for Wastewater Facilities and the Clean Water Program, Volume I and II, April, 1978;
7. Colt, Jon L., Adams County, Letter to Dames & Moore, December 5, 1980 (see Attachment A).
8. Woodling, John, State of Colorado Division of Wildlife, Letter to USEPA Region VIII, December 8, 1980 (see Attachment B).

VIII. AGENCIES CONSULTED

A

Adams County, Administrative Division, Planning and Zoning
Adolph Coors Company
Agricultural Ditch and Reservoir Company

Arvada, City of
Arvada Chamber of Commerce, Legislative Forum of

B

Boyles Ditch Company

C

Church Ditch Company
Clear Creek Valley Water and Sanitation District
Clear Creek Water Users Alliance
Colorado Agricultural Ditch Company
Colorado Air Pollution Control Commission
Colorado Council of Trout Unlimited
Colorado Mountain Club
Colorado Open Space Council
Colorado Public Expenditures Council

Colorado, State of
- Department of Health
  - Division of Air Pollution Control
  - Division of Radiation and Hazardous Materials Control
  - Water Quality Control Division
    - Grants
    - State 208 Coordinator

- Department of Highways

- Department of Local Affairs
  - Division of Planning

- Department of Natural Resources
  - Division of Mined Land Reclamation
    - Mined Land Reclamation Board
  - Division of Parks and Outdoor Recreation
  - Division of Water Resources
    - State Engineer's Office
      - Water Commissioner, District 7
  - Water Conservation Board
  - Division of Wildlife

Governor's Office

Historical Society of Colorado
    Buildings and Sites
    Office of the State Archaeologist

Land Use Commission

Colorado Water Congress
Colorado Water Quality Control Commission
Consolidated Mutual Water Company
Consolidated Reno and Juchem Ditch Company

Commerce City, City of
Corps of Engineers
Cort, Graves, and Hughes Ditch Company
Crestview Water and Sanitation District

D

Denver Chamber of Commerce

Denver, City and County
    Board of Water Commissioners
    Department of Parks
    Department of Public Works
    Department of Recreation
    Planning Office
    Wastewater Management Division

Denver Regional Council of Governments
Dry Creek Valley Ditch Company

E

Eco-Center Environmental Clearing House

F

Farmer's High Line Canal & Reservoir Company
Fisher Ditch Company

G

Golden, City of

H

Historic Denver, Inc.
Holland and Hart Consultants

J

Jefferson County Board of Realtors

- Jefferson County
  - Health Department
  - Open Space Department
  - Planning and Zoning Department

K

Keep Colorado Beautiful

L

- Lakewood, City of
  - Board of Water and Sewer Commissioner
  - Department of Community Development
  - Department of Parks and Recreation

Lee, Stewart, and Eskins Ditch Company
League of Women Voters of Colorado
League of Women Voters of Jefferson County
League of Women Voters of Metro Denver
Leonard Rice Consulting Water Engineers
Lower Clear Creek and Platte River Ditch Company

M

Meiklejohn, Alvin J., Colorado State Senator
Metropolitan Denver Sewage Disposal District Number 1

N

North West Colorado Council of Governments
Northglenn, City of

O

Oulette Ditch Company

P

Platte River Development Committee
Prospect Recreation District
Public Service Company of Colorado

R

Regional Transportation District
Republican Party Water Task Force, Denver County
Rocky Mountain Ditch Company

S

Sierra Club, Rocky Mountain Chapter, Rocky Mountain Center on the Environment
Slough Association

T

Thornton, City of
Tri-County District Health Department

U

United Water Company
University of Colorado
Urban Drainage and Flood Control District

U.S. Department of Agriculture
- Forest Service
- Soil Conservation Service

U.S. Department of Interior
- Bureau of Outdoor Recreation
- Fish and Wildlife Service

U.S. Federal Energy Administration

U.S. Department of Health, Education, and Welfare

U.S. Department of Housing and Urban Development

U.S. Environmental Protection Agency

U.S. Department of Transportation
- Federal Highways Administration

W

Wannamaker Ditch Company
Westminster, City of
Wheat Ridge, City of
Wheat Ridge Sanitation District
Western Paving Company

ATTACHMENT A

BOARD
OF
COUNTY COMMISSIONERS

COMMISSIONERS
Bob Briggs
Ed Harshbarger, Jr.
W.H. Bim Eppinger

ADMINISTRATION BUILDING
450 SOUTH 4TH AVENUE
BRIGHTON, COLORADO 80601
303-659-2120

ADMINISTRATIVE DIVISION
PLANNING AND ZONING

December 5, 1980

Dames & Moore
1626 Cole Blvd.
Golden, CO 80401

Attn: Mr. David C. Clark
Mr. Paul E. Pigeon

Dear Sirs:

My review of your draft Preliminary Technical Report on the Clear Creek Interceptor Project for EPA Region VIII has turned up a very few technical problems, and some additional comments I have to offer on this report. In mentioning these, however, I do not wish to detract from the otherwise high professional quality of this report. In my opinion it has finally begun to quantify many truly significant aspects of the Basin's past, present, and future management in a manner that should be able to inspire the future activities necessary to adequately mitigate the environmental consequences of the proposed interceptor.

First the technical problems:

1. Figure 2-7, Existing Non-Point Source Discharges, Approximate Locations: the map indicates two operating municipal landfills in the lower basin when there is only one. The southwesterly one shown on the map, southwest of 62nd and Huron St., appears to me to be in error. I am unsure of the past history of this parcel, however, beyond the fact that it is not a presently operating municipal landfill.

2. Recreation/trails planning along the proposed interceptor route (page 4-37): Adams County has long planned to make use of every portion of the planned interceptor's right-of-way that is located within the

County for trail development, including the portion from the Metro plant westward along 64th Avenue to Clear Creek. The latter portion has been designated on the County's Recreation Trails Plan for at least several years as a proposed bicycle route. We have not known whether that proposed bike route would be related to the interceptor right-of-way (certainly not if the interceptor ends up directly under the roadway) or the street right-of-way. This is why we have been less assertive about its relationship with the interceptor than we have been about the other trails.

Simultaneously with the preparation of your study, Wright-McLaughlin Engineers has been involved in preparing the Lower Clear Creek Master Drainage Plan, Phase A, for the Urban Drainage and Flood Control District, Adams County, Wheatridge, and Arvada. That study has addressed the proposed changes in the basin's high-flow characteristics as a result of the I-76 extension from Wadsworth to the Valley Highway and the ever-increasing urban development of the basin. It points out that several agricultural ditch headgates may be rebuilt in conjunction with the highway construction, and that the Creek can be expected to be rock-lined and channelled from the vicinity of Wadsworth to below Federal in the forseeable future. From below Federal to the South Platte River, however, the plan is directed toward natural floodplain preservation and maintenance in a manner that would improve both Creek quality and recreational access. I am pleased to see that your study and the Drainage Plan agree in most significant respects, and that together they represent a considerable advance in understanding a very complex basin.

The findings of your study suggest very strongly that unless there is fairly immediate and successful implementation of an effective combination of the mitigating measures presented in your study, the enlarged interceptor capacity proposed by Metro Sewage would, all by itself, incur considerable impact upon the agricultural service areas of the Clear Creek and South

Platte River ("Lower Clear Creek") Canal and the Colorado Agricultural Ditch. I would like to convey my continuing interest in working toward successful modes of implementing these.

Yours truly,

Jon L. Colt
Water Resources/
Comprehensive Planner

JLC:ljo

cc: Michael Gansecki
8W-EE
Environmental Protection Agency
Region VIII
1860 Lincoln St.
Denver, CO 80295

ATTACHMENT B

STATE OF COLORADO
Richard D. Lamm, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
Jack R. Grieb, Director
6060 Broadway
Denver, Colorado 80216 (825-1192)

December 8, 1980

J. W. Geise, Jr.
Chief Environmental Evaluation Branch
United States EPS
Region 8
Suite 103
1860 Lincoln Street
Denver, CO 80295

Dear Mr. Geise:

Thank you very much for the chance to review the draft version of technical Report on the Clear Creek Intercepter Project. The meeting you held on November 25th with me to discuss the draft version of the technical report is also appreciated.

Through both the meeting and the review of the document the Division of Wildlife has arrived at the following conclusions and recommendations.

The proposed interceptor system whereby the waste water being treated by the Clear Creek Valley Water and Sanitation District, City of Arvada, and Wheatridge Sanitation District would be taken to Denver Metropolitan Sewage District for treatment is supported by the Colorado Division of Wildlife. Such an action would remove existing sewage discharges from the Clear Creek System.

Another project discussed in the report, the Golden/Coors Municipal Waste Water Treatment Plant, does not appear to be beneficial to Colorado Division of Wildlife plans and programs. Rationale for these decisions, which is presented below, is the same as we discussed in the meeting in your office on November 25th. According to the report, and the field work that I have done on Clear Creek, the "highest quality" aquatic community in the lower portion of Clear Creek exist in the area of Kipling to Youngfield streets. This stretch of water, according to the draft report, is unaffected by sewage treatment plant discharges but is severly restricted by minimal flows, [page 2-38 the last paragraph, line number 6 says "flows are critically low (less than 3 cfs) until the creek reaches the vicinity of Ralston Creek"]. These observations plus the existance of a fish community in an area of low flows and minimal impacts from existing sewage facilities is the basis for the Division statement regarding the interceptor system. Figures 2-3 through 2-6 illustrate annual flows at various locations along Clear Creek. Kipling street can be located by looking at mile #10 upstream from the South Platte River. This location on all of the maps show those extremely low flows in comparison to the rest of the study basin, yet a rather diverse aquatic community exists. The Division of Wildlife is of the opinion that were the downstream sewage plants, from mile 7 1/2 through 0 eliminated, the aquatic community may well improve in quality from the degraded situation now found in the lower stream reach to the higher quality situation found at stream mile #10. This contention is supported by the observation that over half the water evidently in the stream from mile 7 1/2 through 0 is secondarily treated sewage. Toxic concentrations of chlorine, elevated ammonia levels, and other pollutants are a natural part of secondarily treated sewage effluent.

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Donald Fernandez, Vice Chairman • James Smith, Secretary • Jean K. Tool, Member • Vernon C. Williams, Member

The Division of Wildlife opposition to the Golden/Coors Waste Water Treatment Plant is a continuation of the above described philosophy. If secondarily treated sewage discharge is introduced to the upper portion of the Clear Creek System discussed in this report the aquatic community would in all probability be degraded to the level found currently in the lower section where sewage plants presently discharge. According to the draft report only three cubic feet per second of water is currently found in the Kipling to Youngfield area during portions of the year. If the Golden/Coors Plant were to go on line at a operating capacity of 3 mgd the equivilent of 1 1/2 cfs of sewage effluent would be mixed with 3 cfs of natural stream flow. Toxic concentrations of ammonia and chlorine would surely result from such a discharge scheme.

There are some specific comments relating to specific portions of the report. On page viii., paragraph 3 the last three lines state "conditions in the unsuitable reach below Marshall Street will not be significantly improved by inbasin plant closures". Such a statement is mere conjecture. As discussed above, the decrease in pollutants attributable to sewage plants, which would be realized by the construction of the intercepter system, may well create conditions much like the stream reach at Kipling Street. If this is the case indeed there would be an improvement in aquatic community quality. At present the statement still seems unexceptable in that fish populations are found throughout the stream except in areas below existing sewer plant discharges where excessive chlorine concentrations create toxic zones. These excessive chlorine concentrations where noted in 1976 to be due violations of N.P.D.E.S. permit limitations.

On page 2-38, paragraph 2 the statement is made " the Division of Wildlife suggested a flow of 15 cfs to preserve the natural environment to a reasonable degree". Who, in the Division said this?

Page 2-38, 4th line from the bottom of the page states "flows are critically low...". This use of the word critically is not warranted in that an aquatic community composed of various fish species does exist in this stream segment. In December, 1976, largemouth bass were electroshocked from the stream at this location.

Page 2-47 begins a discussion on water quality. In this section iron and copper are presented to be rather excessive in concentration and perhaps limiting for aquatic life. Indeed the levels of the two metals mentioned above are slightly elevated but not to a degree that would inhibit fisheries populations. Concentrations of metals in Clear Creek below Golden are substantially lower than in the mountains due to dewatering.

Page 2-69 shows plate no. 3 with the citation "Broadway - stagnant water with an organic scum covering surface". This terminology is quite misleading. To begin with, through a 15 month sampling period, including several 24 hour diel dissolved oxygen studies, no stagnant situations were discovered along Clear Creek. Secondly, if the picture was taken in 1979 or 1980, in all likelyhood the organic scum which covered the surface was due to discharge from a landfill currently being utilized in this stream region. The illegal landfill was operating without an N.P.D.E.S. permit.

Page 2-71, last paragraph deals with residual chlorine and the last four lines state "it is apparent that only short segments of the stream (below sewage treatment plants) are void of fish and that any variations in the concentrations of total residual chloring at the effluent would probably not cause massive fish kills". This sentence I find extremely confusing. The reason fish aren't in these streams reaches is because of the chlorine. The chlorine is there because of violations of enforceable N.P.D.E.S. permit limitations. If chlorine where controlled fish would, of course, move into these stream reaches. Since the plants do discharge too-much chlorine, any additional purges of chlorine of increases of chlorine would undoubtedly move fish farther downstream or kill them.

Page 4-21 has a section dealing with future mine drainages. The last paragraph states that additional mining will take place and discharge permits for mining operations will not be enforced. I believe the days of uncontrolled discharge from active mines are at a close. If as the report states on page 4-21 that inactive facilities are cleaned up the result will be a net decrease in metals to Clear Creek. This decrease in metals may fully well effect aquatic communities all the way to the mouth of Clear Creek since current impacts are probably minimal. The statements made in the last paragraph of page 4-21 are therefore invalid and inaccurate.

In conclusion, two additional comments should be made concerning the proposed Golden/Coors Sewage Plant. First, if the this secondarily treated effluent is discharged to the Croke Canal hence to Standley Lake, implications will certainly rise concerning drinking water, public health (since the reservoir is utilized for water skiing), and eutrophications problems regarding the fisheries. Currently the Colorado Division of Wildlife had a very extensive program of stocking crappie, walleye, bass, and catfish into Stanley Lake. This resource is available to anyone within the metropolitan area. Recently I have heard that Jefferson County Open Space may want to purchase Standley Lake. I do not have any confirmation of this statement. Degredation through eutrophication is certainly not warranted. Secondly, if the sewage effuent is discharged to Clear Creek, degradation of that system will certainly result. The alternative is to establish the more stingent water quality standards as currently proposed by the Colorado Water Quality Control Commission. If this situation where to come about, the proposed treatment plant at Golden for the Golden/Coors facility, could be designed for a higher level of treatment. A phosphorus removing filtration system followed by chlorination/dechlorination is certainly warranted to maintain the status quo in Clear Creek and/or Standley Lake.

Since our last conversation I have determined that there is not a swim beach at Standley Lake.

I hope these comments are of some help to you. If you have any questions or I can provide any help, please fill free to contact me at the Division office.

Sincerely,

John Woodling

John Woodling
Fish Program Specialist

JW/rmm

cc: Pete Barrows
Chuck Grand Pre
Phil Goebel